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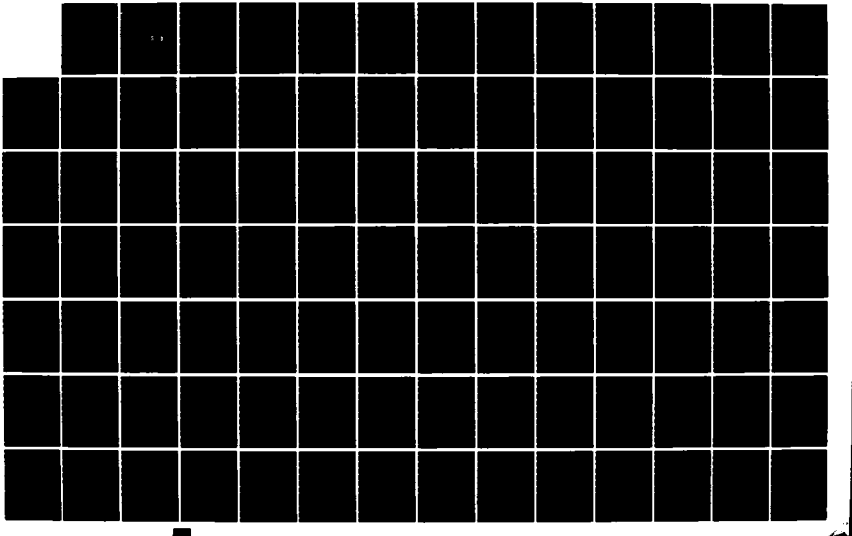

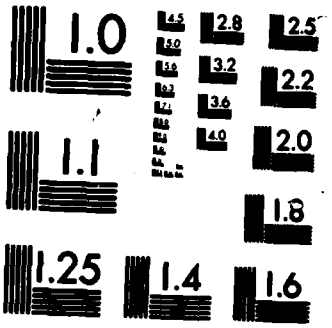

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LOGISTICS SUPPORT PLAN
FOR
INSHORE UNDERSEA CABLE SYSTEMS REPAIR

FPO-1-77(31)
September 1977

OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, D.C. 20374

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The results of recent inspection and repair operations, by the Underwater Construction Team (UCT) of the Naval Construction Force (NCF), in support of the Naval Electronic Systems Command (NAVELEXSYSCOM) undersea cable systems have indicated that complex logistics problems have to be solved in (Con't)

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order that undersea cable systems can be restored to an operational status in a minimum amount of time. Accordingly, the Naval Facilities Engineering Command (NAVFACENGCOM) tasked Chesapeake Division, Naval Facilities Engineering Command (CHESNAVFACENGCOM) to prepare a Logistics Support Plan (LSP) for Undersea Cable Systems Repair. Specifically, the LSP should address casualty repairs to the inshore portion of undersea cable systems, that is, that portion of an undersea cable system that extends from the at-sea 120-foot depth contour to the beach cable splice or if there is no beach cable splice, to the mean high-high-water (MHHW) line.

This planning document established the steps necessary to achieve a Navy readiness capability to respond to an undersea cable system casualty. Initially, this document undertakes an analysis of a typical operation to determine the improvements required in the present readiness capability. These improvements are developed into planning objectives and concepts for achieving the objectives. The most cost effective concepts are selected and detailed in a work breakdown structure and schedule.

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The results of recent inspection and repair operations, by the Underwater Construction Teams (UCT) of the Naval Construction Force (NCF), in support of the Naval Electronic Systems Command (NAVELEXSYSCOM) undersea cable systems have indicated that complex logistics problems have to be solved in order that undersea cable systems can be restored to an operational status in a minimum amount of time. Accordingly, the Naval Facilities Engineering Command (NAVFACENGCOM) tasked Chesapeake Division, Naval Facilities Engineering Command (CHESNAVFACENGCOM) to prepare a Logistics Support Plan (LSP) for Undersea Cable Systems Repair. Specifically, the LSP should address casualty repairs to the inshore portion of undersea cable systems, that is, that portion of an undersea cable system that extends from the at-sea 120-foot depth contour to the beach cable splice or if there is no beach cable splice, to the mean high-high-water (MHHW) line.

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This plan is divided into the following three phases:

Phase I: Establishment of the Program and Requirements including:

- o Coordinating the effort with Fleet and Systems Command
- o Obtaining OPNAV approval of the plan

Phase II: Upgrading of Assets and Advance Planning including:

- o Designing, testing, and acquiring the equipment, facilities, and materials that have been identified as required to supplement existing inventories
- o Developing lists of total assets needed for repairs at each site and locating these assets for ready accessibility
- o Preparing packaging and mobilization plans to assemble personnel and assets for any inspection or repair contingency
- o Formulating transportation plans for rapid movement of assets and personnel from home bases to the beach at any repair site

Phase III: Documentation of Orders, Responsibilities, and Procedures including:

- o Preparing standing documents required to coordinate the various involved activities in getting underway with minimal delay
- o Preparing Inspection Project Execution Plans that detail exactly how an inspection operation for each site would proceed
- o Establishing a standing CHESNAVFACENGCOM task group for immediate translation of repair requirements into repair procedures

- o Preparing all elements of Cable Repair Project Execution Plans that can be assembled without foreknowledge of the actual casualty details.

Much of the Phase II and Phase III efforts are dependent on the outcome of the systems engineering effort in Phase I. Consequently, a schedule and cost estimate are developed for phase I only.

1.0 INTRODUCTION

1.1 PURPOSE OF THE PLAN

A significant Underwater Construction Team (UCT) capability has been developed to provide support for the maintenance and repair of inshore undersea cable systems as a result of recent inspections and repair operations. The purpose of this plan is to describe a series of events which, when implemented, will improve the UCT readiness capability to support inshore undersea cable systems. When this plan is approved by subordinate commands and implemented by the Chief of Naval Operations (CNO), the UCT will ultimately realize an improved readiness capability to deploy rapidly and conduct safe, efficient, and effective inspections and repairs in support of inshore undersea cable systems.

The implementation of this plan will require a significant amount of capital investment, command coordination, and potential private industry involvement. This plan is a three phase approach and it is anticipated that a total of five years will be required to acquire an improved UCT readiness capability. Accordingly, the implementation of this plan will require the establishment of a program with the associated identification and apportionment of funds.

1.2 BACKGROUND

Prior to the formation of the UCT as operational components of the Naval Construction Force (NCF), the NCF completed several construction and repair projects in support of the Naval Electronic Systems Command (NAVELEXSYSCOM) undersea cable systems. These projects involved installation,

inspection and repair of new and existing cable systems in the surf zone and included related beach construction. These projects clearly demonstrated the potential capability of the NCF to support NAVELEXSYSCOM requirements. Accordingly, by reference (a)*, it was requested that the NCF be designated as the construction agent for the underwater inspection, installation, and repair of NAVELEXSYSCOM undersea cable systems. References (b) and (c) provided Fleet Commander endorsement for this request and detailed actions considered necessary to achieve the required support capability. In response to NAVELEXSYSCOM's request, and other Navy underwater construction requirements, two 37-man UCT's were officially established by CNO as operational components of the NCF. This was accomplished by reference (d). References (e) and (f) indicated that the UCT would be capable of responding to NAVELEXSYSCOM requirements on 1 July 1974.

References (g) and (h) are Commander, Naval Construction Battalions, U.S. Atlantic Fleet (COMCBLANT) and Commander, Naval Construction Battalions, U.S. Pacific Fleet (COMCBPAC) operational plans which enable the UCT to respond rapidly to meet NAVELEXSYSCOM requirements.

Reference (e) further requested Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM) to develop the basic plans and technical guidance to insure a safe and efficient operational response to NAVELEXSYSCOM requirements. Reference (i) requested that the Chesapeake Division, Naval Facilities Engineering Command (CHESNAVFACENGCOM)

*References are listed in Appendix A.

prepare and coordinate the approval of a Logistic Support Plan (LSP) for Inshore Undersea Cable Systems Repair.

1.3 METHODOLOGY

In this plan, an analysis of a typical casualty inspection and repair operation is performed to establish the present capability to repair inshore undersea cable systems. The analysis identifies areas where the present capability can be improved. The areas of improvement are categorized as logistics elements and matched, in a matrix, against phases of an inspection and repair operation. The matrix is utilized to define planning objectives and cost effective concepts for meeting the planning objectives. The cost effective concepts are developed as tasks in a work breakdown structure.

2.0 TYPICAL CABLE REPAIR SITUATION

2.1 STATEMENT OF THE PROBLEM

Casualties to inshore undersea cable systems are caused by many factors but usually by excessive cable motion due to hydrodynamic forces and disruption by equipment towed by commerical fishing vessels. The casualties can result from either a clean break in the cable or, for certain types of cable, from a fault caused by water intrusion into the cable jacket. Both types of casualties render the cable inoperative. Figure 1 is a

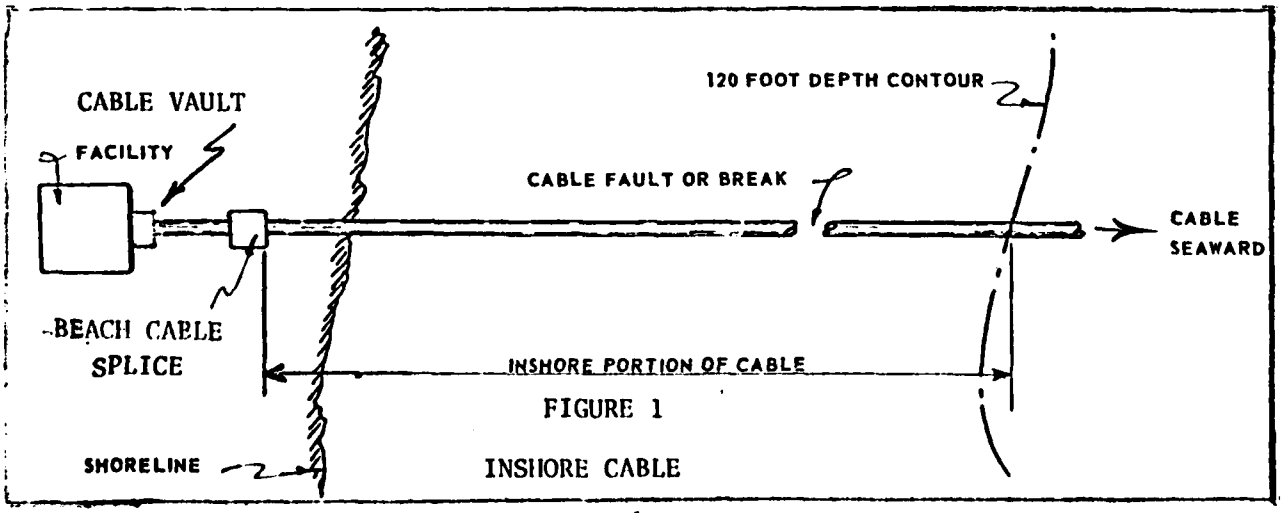

FIGURE 1

INSHORE CABLE

schematic representation of an inshore cable route showing the location of a cable fault or break, and shows the shore-end termination of the cable at a facility on the beach. The inshore portion of the cable system extends from at-sea 120-foot depth contour to the beach cable splice or if there is no beach cable splice, to the mean high-high-water (MHHW) line.

2.2 DESCRIPTION OF INSHORE CABLE SYSTEM

Inshore undersea cable systems, Figure 2, generally consist of the cable and a protection and stabilization system. The cable is frequently encased inside a series of interlocking sections of protective split pipe. This split pipe is stabilized along rocky bottoms with rock bolts running through the flange bolt holes and U-rods running over the top of the split pipe. The split pipe is made of nodular cast iron; standard sizes are available with inside diameters of 3.5 or 5.0 inches and a length of three feet.

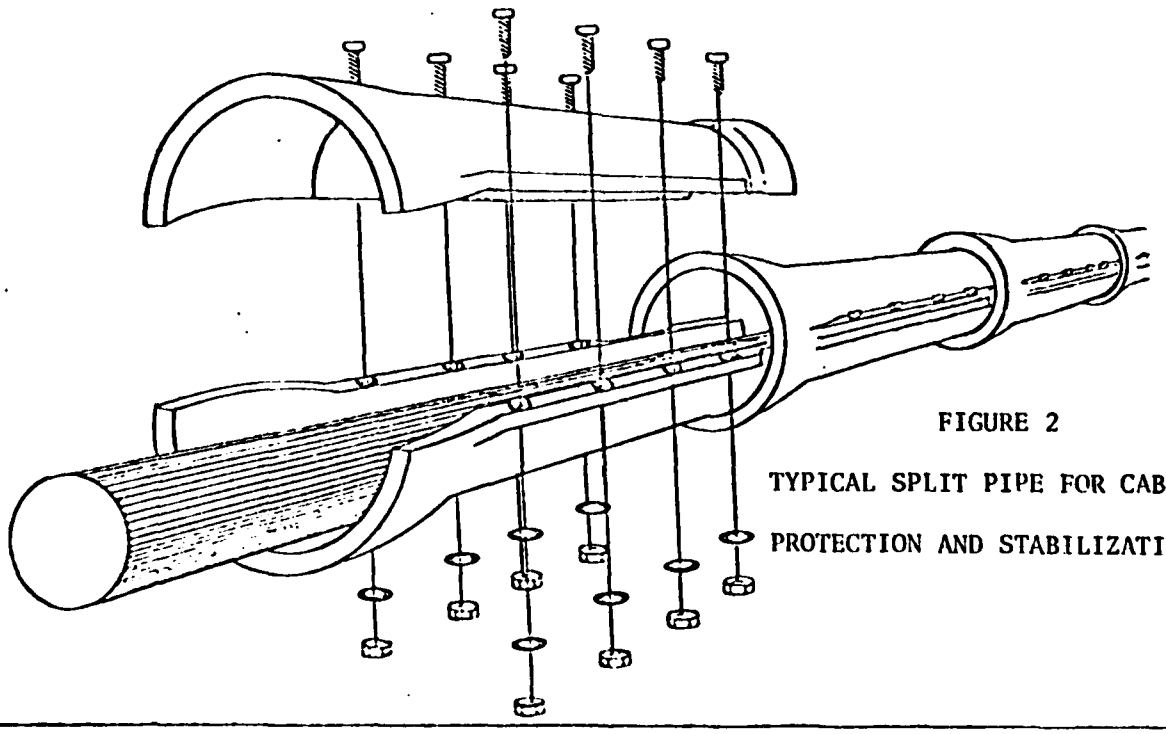

FIGURE 2

TYPICAL SPLIT PIPE FOR CABLE PROTECTION AND STABILIZATION

2.3 OPERATIONAL SCENARIO

NAVELEXSYSCOM has the responsibility for the maintenance and repair of inshore undersea cable systems at nineteen Navy sites and four Air Force sites. The graphical distribution of these sites is shown in Figure 3. The UCT function is to repair the inshore portion of the cable, that is, the portion extending between the at-sea 120-feet depth contour to the beach cable splice or if there is no beach cable splice, to the MHHW line. Initially, the UCT conducts a cable inspection to locate precisely the fault or break. The cable repair is affected by splicing a cable replacement section around the fault or break.

The UCT support function is described in the context of the following typical operational scenario: upon notification of an inshore cable fault, NAVELEXSYSCOM requests tasking of the UCT via CINCLANT/CINCPAC and CBLANT/CBPAC. A UCT inspection team and a CHESNAVFACENGCOM technical representative deploy to the site. The UCT inspection personnel locate precisely the cable fault/break and, in conjunction with the CHESNAVFACENGCOM technical representative determine the personnel, equipment, and material requirements to effect the cable repair. The OIC of the UCT and the CHESNAVFACENGCOM technical representative recommend to NAVELEXSYSCOM what they consider to be the best approach to repairing the cable. Upon NAVELEXSYSCOM acceptance of the recommended approach, a UCT repair team with the required equipment and material is mobilized and deployed to the site.

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The UCT perform repair operations in accordance with the following sequence: recover cable ends for splicing to replacement cable section which may involve destabilizing and removing split pipe sections and if the cable is not completely severed it will also be necessary to cut the cable underwater; float cable ends to the sea surface; move a replacement cable into position; operate an ocean construction platform on which Western Electric Company (WECO) representatives splice the cable; re-lay the repaired cable on the sea floor which may involve re-applying split pipe sections and placement of stabilization elements to hold the encased cable to the sea floor; conduct a final inspection of the repaired cable system.

2.4 SCOPE

This plan addresses the accomplishment of inspection and casualty repairs by the UCT to the inshore portion of undersea cable systems, that is, the portion of the undersea cable system that extends from the at-sea 120-foot depth contour to the beach cable splice or if there is no beach cable splice, to the MHHW line.

2.5 COMMAND ORGANIZATION AND RESPONSIBILITIES

As a result of previous inspection and repair operations, an organizational structure between the various participants as it affects the repair of undersea cable systems has evolved and is indicated in Figure 4.

The organizational responsibilities are outlined as follows:

- Naval Electronics Systems Command (NAVELEXSYSCOM): System material responsibility; initiates tasking and project funding; overall technical responsibility including responsibility for approval of all project plans and speci-

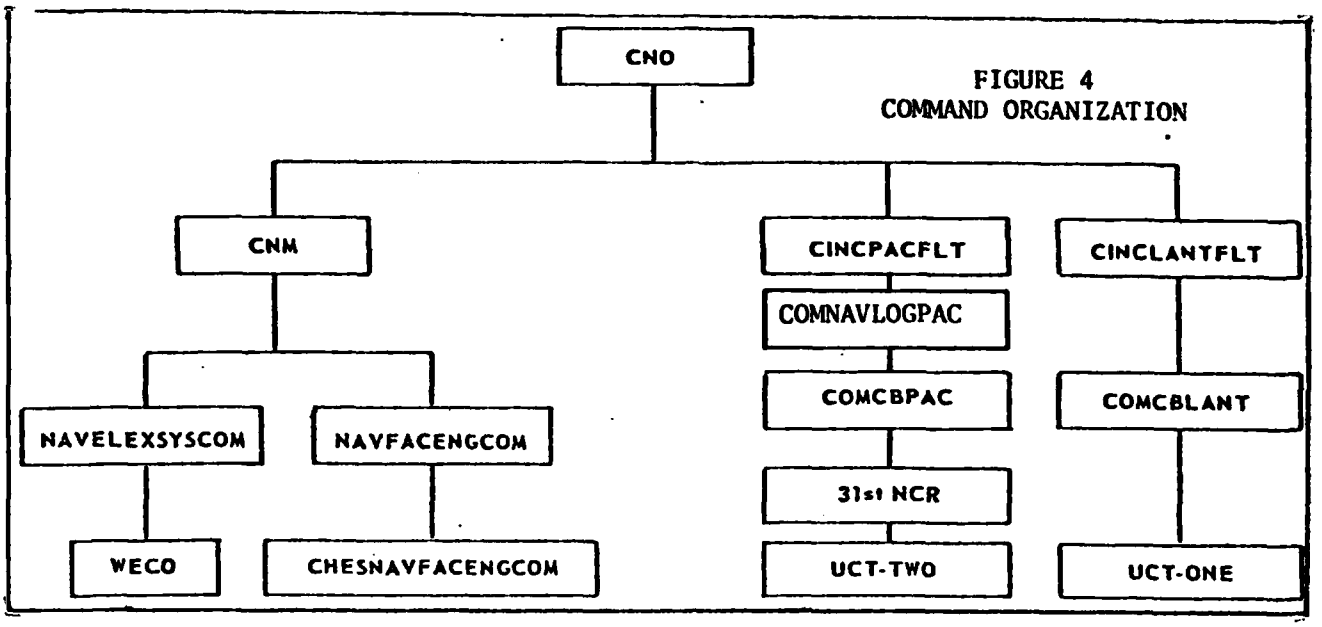


FIGURE 4
COMMAND ORGANIZATION

fications; responsible for providing repair cable and protection/stabilization system materials.

- o Underwater Construction Team (UCT): Officer in Charge (OIC) of project; operational control of project; responsible for procurement of team construction and diving equipment.
- o Western Electric Company (WECO): Technical responsibility for fault location and splicing operations; responsible for procurement of splicing equipment, and final cable quality check.
- o Chesapeake Division, Naval Facilities Engineering Command (CHESNAVFACENGCOM): Technical responsibility for operations; responsible for financial management (less cable and WECO operations) and for procurement of materials and equipment non-organic to UCT or WECO; responsible for project planning and for project completion report.

3.0 REQUIREMENTS AND OPERATIONS ANALYSIS

The purpose of this analysis is to definitize requirements for responding to a casualty and determine what has to be accomplished in order to meet those requirements. A typical inspection and repair operation is analyzed for a hypothetical but typical site. Events, tasks, personnel, skills, equipment and procedures are analyzed for improvement during each day of a typical inspection and repair operation.

3.1 RESPONSE REQUIREMENTS ANALYSIS

Reference (a) states the requirement that the UCT inspection team be deployed within 24 hours and the repair team within 48 hours after a cable casualty is reported. A copy of reference (a) is included in Appendix A.

Later in this plan an analysis of inspection and repair operations is presented. Based on this analysis, the 24 and 48 hour requirement is interpreted to mean that the UCT inspection team must be deployed within 24 hours after notice of a casualty. The UCT repair team, however, must be deployed within 48 hours after the following events have occurred:

- o The UCT cable inspection has been completed.
- o A presentation has been made to NAVELEXSYSCOM on the cable inspection and a cable repair technique recommended.
- o An engineering solution(s) has been developed detailing the recommended approach to repair the cable.
- o The approach has been approved and a decision made by NAVELEXSYSCOM to commence the repair operation.

3.2 OPERATIONAL ASPECTS ADDRESSED

This plan will address the following:

- o Cable repair operations in support of nineteen Navy and four Air Force sites.

- o Deployment of a UCT inspection team within 24 hours after the receipt of a cable casualty report.
- o Deployment of a UCT repair team within 48 hours after the cable repair project execution plan has been approved and a decision made by NAVELEXSYSCOM to proceed with the repair operation.
- o Deployment of either UCT ONE or UCT TWO to each site but not the redeployment of a UCT in the event of a cable casualty report at another site.

3.3 OPERATIONAL PHASES

For the purpose of this analysis an inspection and repair operation is subdivided into the following sequential phases:

- o Readiness: homeport status before a cable casualty is reported.
- o Mobilization: the events between a casualty report and the UCT personnel and equipment embarkation to the site.
- o Transit: the period of time between embarkation to the site including: disembarkation at point of entry, movement of assets to the site, and setup of the beach station.
- o Operations: the period of time for the actual inspection or repair.

3.4 ASSUMPTIONS

The following assumptions are made about a typical site:

- o The site has two cables but only one cable is damaged.
- o The two cables are sufficiently close together so that it is advisable to chart both cable routes.
- o Two different types of cable repair operations are considered in the analysis: first, a cable fault occurs at 50 foot

water depth and the repair is affected by towing a short (500 feet) replacement cable section from the beach; second, a cable fault occurs at 50 foot water depth and a cable break occurs at 75 foot water depth. In this second case, the cable fault and break are sufficiently far apart so that the repair has to be affected by landing a long (6000 feet) replacement cable section from a cable ship. These two distinct cable repair operations are addressed separately in the analysis.

- o The cable traverses some rock and some sand.
- o Underwater visibility is 20 feet and bad weather does not interfere.

Additional assumptions relative to the operation itself are:

- o A working day is 10 hours and there are no equipment failures.
- o Both the inspection and the repair team transit to the site by aircraft. The site has an airstrip.
- o The replacement cable section and the stabilization system elements are available.
- o A boat is available as an ocean construction platform.
- o The repaired cable will be stabilized using split pipe, rock bolts and U-rods.

3.5 INSPECTION OPERATIONS

The steps to be followed during each day of a hypothetical inspection operation are delineated in Appendix B.

The UCT personnel required to perform this inspection comprise one Officer-in-Charge (OIC), O-3, or above, one Leading Petty Officer (LPO), E-7, or above, seven enlisted men, E-6 and below, for a total of nine UCT

personnel in the inspection team. All nine UCT personnel must be trained in undersea cable system inspection procedures. Additional special skills required among the seven enlisted men include: one Construction Electrician (CE), one Equipment Operator (EO), one Construction Mechanic (CM), one Engineering Aid (EA), and one Hospital Corpsman (HM).

Equipment required for this typical inspection operation includes: charts and other data relative to the site, drafting supplies, blackboard, tri-wall containers, underwater cameras, underwater video system, transits, Mini-Ranger, radios, dive compressors, dive tanks, dive gear, float balloons, 50 pound clump anchors, 9-thread, 15-thread, 21-thread line, MK-14 cable locators, and a 12 foot and a 19 foot Zodiac, each fitted with a 25 HP outboard.

Sufficient personnel, with the required skills and training, are available in both UCT ONE and UCT TWO to meet the requirements for mobilizing a qualified inspection team within the prescribed 24-hour time limit. Similarly, the equipment necessary to outfit these teams is available on both the East Coast and on the West Coast. If a project execution plan for the operation were available, personnel and equipment could be mobilized and transited to a selected site, and a complete underwater inspection of a cable casualty conducted within ten days of notification that a casualty had occurred.

The only deficiency in the UCT capability to conduct undersea cable inspections is the lack of an existing cable inspection project execution that is specifically designed for each of the 23 sites. Many of the basic elements of these 23 project execution plans are available. For example,

CHESNAVFACENGCOM has issued a standard procedure for underwater cable inspection, reference (j), which details how the inspection should be conducted and reported. Furthermore, both UCT ONE and UCT TWO are generally aware of the types of personnel and equipment that will be required for such an operation. However, detailed project execution plans should be prepared, one for each site, that delineates specifically the personnel and equipment requirements peculiar to that site, transportation plans for the deployment, on-site directives for reporting and obtaining logistics support, location charts of landmarks and underwater cable routes, and any other information essential to the rapid deployment of a fully equipped inspection team to the site where a casualty occurs.

3.6 INTERIM OPERATION

Between the completion of the inshore undersea cable system inspection and the mobilization of the repair team, the results of the inspection are briefed to NAVELEX, a cable repair technique is recommended, a cable repair project execution plan is developed and approved. For this interim period, the events or tasks followed during each day are delineated in Appendix C. In order to illustrate the overall time frame, the days covering this interim period are assigned designations based upon the day on which the inspection team is mobilized. This same practice will be continued throughout the hypothetical repair operation. A total of eight days (D+11 to D+18) are required between the completion of an inspection and the mobilization of a cable repair team.

An important aspect of this interim phase of the overall operation is the timely development of a project execution plan for the repair operation. During the five days allotted after the general repair operational approach has been agreed upon, CHESNAVFACENGCOM is required to perform the necessary engineering and logistic analyses to evolve a plan that details how the repair operation will be organized, the personnel and equipment that will be required, the materials needed, the most effective means of transporting these to the site, and how all necessary support facilities will be provided.

Although each repair operation at any specific site will be unique there will be a certain commonality in the personnel, skills, equipment, materials, and facilities required to perform all undersea cable repairs. Similarly, there are many elements that will be common to all cable repair project execution plans and other site-related elements and data that can be assembled in advance. It is therefore logical that in order to upgrade the capability to prepare these project execution plans within the minimal time frame allotted in the foregoing schedule it is essential that these elements be collected and put in such form that they can be rapidly incorporated into a repair plan for any site or for any repair situation. Similarly, personnel with the capability of developing a cable repair project execution plan should always be available on short notice to reduce the time between inspection and repair to an absolute minimum.

3.7 REPAIR OPERATIONS

Two types of cable repair operations are analyzed in Appendix D.

First, towing a 500 foot replacement cable section from the beach to the location of the cable fault or break and second, landing a 6000 foot replacement cable section from a cable ship positioned offshore. The events and tasks occurring between D+19 and D+32 will be the same for both types of operations. The repair operations, for the situation where a 500 foot replacement cable is to be towed out from the beach, are delineated for the period D+33 through D+47. The repair operations for the period D+33 through D+50 are repeated for the situation where a 6000 foot length of replacement cable is hauled in from a cable ship.

In addition to the eight UCT enlisted personnel remaining on-site after the cable inspection operation, ten additional enlisted men are required for the repair operations. After the UCT Officer-in-Charge (OIC) returns to the site, the total repair team comprises one OIC, O-3 or above, one enlisted Leading Petty Officer (LPO), E-7 or above, and seventeen enlisted men, E-6 and below. All nineteen men are trained in underwater cable inspection and repair procedures and in cable protection and stabilization. Among the enlisted personnel, E-6 and below, the skills required are one Construction Electrician (CE), one Equipment Operator (EO). one Construction Mechanic (CM), one Engineering Aid (EA), one Hospital Corpsman (HM) and one Steel Worker (SW). Sufficient personnel, with the required skills and training, are available in both UCT ONE and UCT TWO to perform undersea cable repairs for the typical cable repair operation.

The typical repair operation is based on recent repairs conducted at Keflavik, Iceland. Specific equipment and material requirements will be

developed from a specific inspection operation for an actual repair and addressed in the repair project execution plan. There is a significant degree of commonality of equipment and material required for inshore cable repairs; thus most equipment and material required during the operations phase of a repair is available and stocked in inventories. Special split pipe end configurations are often required during cable repair operations but are not available in any inventories. Fabrication and welding of these special configurations during operations tends to extend the completion time of the repair.

Transporting repair personnel with sufficient equipment and material to commence cable repairs is a potential deficiency in the present UCT capability. In the typical repair operation analysis it was assumed that the following site resources were available: adequate weight-handling equipment and vehicles to transport repair equipment and material to the beach; a floating platform convertible to an ocean construction platform; an ocean construction platform modification plan including a platform mooring design; material to modify the ocean construction platform; and special cable landing equipment such as range poles and range lights. Presently, these resources would have to be identified and made available on site.

The UCT capability to conduct undersea cable repairs at any site can be improved by:

- Having required weight-handling equipment and vehicles available on site.
- Identifying repair equipment and cable protection and stabilization requirements for all sites and having equipment available in the event of a casualty.

- o Being able to deploy repair personnel with sufficient repair equipment and material within 48 hours of the completion and approval of a repair plan.
- o Having the remaining repair equipment and material on-site when it is required.
- o Having special cable landing equipment and split pipe configurations available prior to a casualty.
- o Having an ocean construction platform identified and available on-site for splicing and split pipe installation.
- o Having a capability to modify rapidly a floating platform into an ocean construction platform.
- o Obtaining information on sites that have not yet been surveyed.
- o Having a standing document available which details cable repair operations and organizational interfaces and responsibilities.

4.0 LOGISTICS ANALYSIS

4.1 ANALYTICAL APPROACH

The purpose of this analysis is to develop planning objectives and to recommend concepts which will eliminate the deficiencies identified in the operations analysis, thus improving the current UCT capability to inspect and repair undersea cable systems.

Planning objectives are developed by forming a checklist, or matrix, matching the phases of an inspection and repair operation with selected logistics elements. The selected inspection and repair operational phases are readiness, mobilization, transit and operations; these phases were defined in section 3.3. Logistics elements are: equipment, personnel,

FIGURE 5

MATRIX OF LOGISTICS ELEMENTS AND OPERATIONAL PHASES

LOGISTICS ELEMENTS	READINESS	MOBILIZATION	TRANSIT	OPERATIONS
EQUIPMENT	●	●	●	●
PERSONNEL	○	○	○	○
TRAINING	○	— — —	— — —	— — —
COMMAND & CONTROL	○	○	○	○
PACKAGING	●	●	— — —	— — —
SUPPLY SUPPORT	●	●	●	●
FACILITIES	●	— — —	●	●
DATA & INFORMATION	●	●	●	●

training, command and control, packaging, supply support, facilities, and data and information. These logistics elements are selected as a method of categorizing or summarizing both adequacies and deficiencies identified in the operations analysis.

This matrix is illustrated in Figure 5. The intersection of an operational phase and a logistic element will be referred to as a matrix element. The solid circles represent applicable matrix elements where the current UCT capability can be improved and therefore planning objectives, concepts, and a work breakdown structure are developed for these matrix elements. The applicable matrix elements are defined prior to each planning objective in Appendix E.

The open circles represent matrix elements where the current UCT capability is considered adequate and no further improvement is considered necessary as long as the current capability is maintained.

The dashed lines indicate matrix elements where a logistics element and an operational phase are not applicable to each other. For example, no training is conducted during actual mobilization for an inspection and repair, transit to a site, or during field operations.

4.2 EXPANSION OF REQUIREMENTS FOR IMPROVED CAPABILITY

During the interim period between these operations, there is a requirement for CHESNAVFACENGCOM personnel to provide the technical support necessary to prepare a cable repair project execution plan on extremely short notice. To ensure that this capability is in a continuing state of readiness it is recommended that the CHESNAVFACENGCOM support personnel comprise the CHESNAVFACENGCOM CAESAR Project Officer, an engineer, and clerical support. The engineer and clerical support should be assigned on a rotating basis and designated as a task team to prepare any cable repair project execution plan required during their assigned quarter.

The operations analysis has shown that trained UCT personnel available in sufficient numbers and possess adequate skills for both the inspection and repair operations.

A pattern of command and control has evolved as a result of previous inspections and repairs. However, a standing document such as an OPLAN or OPORD should be developed to improve overall coordination in the event of a cable casualty.

Because of the foregoing considerations Personnel, Training, Command and Control will be treated directly in the work breakdown structure. For the remaining applicable matrix elements, planning objectives are developed in Appendix E. For each objective, various concepts are analyzed to evolve a series of recommendations of what concepts should be pursued in carrying out the logistics support plan. In Figure 6, these planning objectives are delineated and the recommended concepts are listed in summary form.

5.0 IMPROVEMENT OF INSPECTION AND REPAIR CAPABILITIES

5.1 ELEMENTS OF THE LOGISTICS SUPPORT PLAN FOR CAPABILITY IMPROVEMENT

From a review of the planning objectives of Figure 6, and the recommendations made regarding work elements to be performed in attaining these objectives, a pattern emerges as to what must be accomplished in order to bring about the improved capability that is desired. The end result of carrying out this logistics support plan for inshore undersea cable systems repair will consist of a readiness capability to respond more rapidly and to restore damaged cables to an operational condition in significantly less time than is currently possible.

In the foregoing sections the technical and logistics aspects of a typical inspection operation and a typical repair operation have been analyzed. The typical site selected for these analyses bears a strong resemblance to that at Keflavik, Iceland. This was a logical selection since inspection and repair operations have recently been completed

FIGURE 6

PHASES		EQUIPMENT	PACKAGING	SUPPLY SUPPORT	FACILITIES	DATA &INFORMATION
READINESS	OBJECTIVE	• Identify equipment required for each cable installation site • Have equipment available at site or ready for deployment • Have ocean construction platform available and modified	• Have available adequate containers	• Have cable and protection and stabilization system available • Have repair parts identified and available	• At all sites, have mooring, berthing, administration, dive locker, and shop facilities identified and available in the event of a reported casualty	• Have available complete data and information on all sites including cable layout, environmental data, and available facilities, equipment, and materials
	RECOMMENDATION	• Develop specific equipment lists for each site • Partially dedicate equipment unique to cable repair operations • Arrange for ocean construction platform availability and prepare modification plan	• Develop a packaging plan for each site and acquire necessary containers	• Maintain adequate inventories of cable, cable protection, and stabilization systems • Develop COSALS for all inspection and repair equipment	• Examine information on each site and, where adequate facilities are not available, arrangements should be made for portable facilities to make up any deficiencies	• Analyze available site survey reports to extract needed data • Conduct additional surveys as required to complete data bank on all sites
MOBILIZATION	OBJECTIVE	• Have inspection equipment ready for transit • Have repair equipment ready for transit	• Minimize time required to package materials and equipment after a casualty report	• Minimize the time required to mobilize equipment repair parts and consumables		• Have data and information necessary to mobilize personnel, equipment, portable facilities, material, repair parts, and consumables
	RECOMMENDATION	• Develop a mobilization plan for each site for inspection and repair equipment	• Develop equipment and material load-out lists	• Develop repair parts and consumables lists for each site as part of the mobilization plan		• Prepare sections of project execution plans for each site that specify total mobilization data and information
TRANSIT	OBJECTIVE	• Have all modes of transportation to each site available in the event of a casualty report		• Have all modes of transport lined up to move equipment spare parts and consumables to each site when required	• At sites where portable facilities are required, have these facilities transported to the site	• Have available data and information on all modes of transportation required to move UCT personnel and equipment to any site
	RECOMMENDATION	• Prepare transportation plan for each site		• Include transport of equipment spare parts and consumables in the transportation plan	• Include in transportation plans the movement of portable facilities to those sites where they are required	• Create a transportation section of a project execution plan containing all needed data and information for each site
OPERATIONS	OBJECTIVE	• Have spare equipment available on site		• Have adequate equipment repair parts and consumables on site so that minimal resupply will be necessary during operations	• Have arrangements made to utilize on-site facilities whenever possible	• At completion of any operation have data and information required to prepare the report on the operation
	RECOMMENDATION	• Identify and transport critical spare equipment		• Identify in project execution plans and stock critical repair parts and consumables in homeport inventory	• Develop standing document, OPLAN or OPORD, that specifies facility requirements at each site	• Collect all operational data needed to prepare final report • Prepare cable inspection and repair and survey reports as required

at that site which provide a sound basis for projecting what may be required in like circumstances at the other sites covered by this plan.

However, it cannot be assumed that every operation will be identical to that described. Not only will there be major physical and environmental differences at other sites but the on-site equipment, facilities, materials, and organizational support may differ radically. These differences have been generally discussed in Appendix E and summarized in Figure 6. These differences translate into planning objectives to be addressed in formulating an overall program to develop an improved capability for inshore undersea cable inspection and repair at all 23 sites where a cable break or fault may occur.

The logistics support plan that evolves from these considerations falls into three broad phases of development as follows:

Phase I: Establishment of Program and Requirements Analysis

- o Coordinating the effort with Fleet and Systems Commands
- o Obtaining OPNAV approval of the plan
- o Acquiring information and data for sites on which site surveys have not been performed
- o Analyzing operational requirements as they relate to all sites where repairs may be required
- o Deriving the requirements for equipment, facilities, and materials not in current inventories

Phase II: Upgrading of Assets and Advance Planning

- o Designing, testing, and acquiring the equipment, facilities, and materials that have been identified as required to supplement existing inventories
- o Developing lists of total assets needed for repairs at each site and locating these assets for ready accessibility
- o Preparing packaging and mobilization plans to assemble personnel and assets for any inspection or repair contingency
- o Formulating transportation plans for rapid movement of assets and personnel from home bases to the beach at any repair site

Phase III: Documentation of Orders, Responsibilities, and Procedures

- o Preparing standing documents required to coordinate the various involved activities in getting underway with minimal delay
- o Preparing Inspection Project Execution Plans that detail exactly how an inspection operation for each site would proceed
- o Establishing a standing CHESNAVFACENGCOM task group for immediate translation of repair requirements into repair procedures
- o Preparing all elements of Cable Repair Project Execution Plans that can be assembled without foreknowledge of the actual casualty details.

There are a number of work items in the second and third phases above that can proceed concurrently. However, much of what must be done in these latter phases is dependent upon input from Phase I. Accordingly, the Phase I effort can be scheduled and a cost estimate made but the cost and time required for Phases II and III cannot be definitively set down until Phase I is completed.

The total activity involved in bringing about this upgraded capability to inspect and repair inshore undersea cables efficiently, effectively, and safely involves the coordinated and dedicated efforts of a number of different organizational entities. These efforts are delineated in the Work Breakdown Structure shown in Figure 7. Each of the five sections that follow covers a major aspect of the capability development program wherein the organizations charged with the responsibility and the execution of each individual task are identified and the task itself is briefly described.

5.2 LOGISTICS SUPPORT PLAN -- 1.0.0 CAPABILITY DEVELOPMENT PROJECT MANAGEMENT

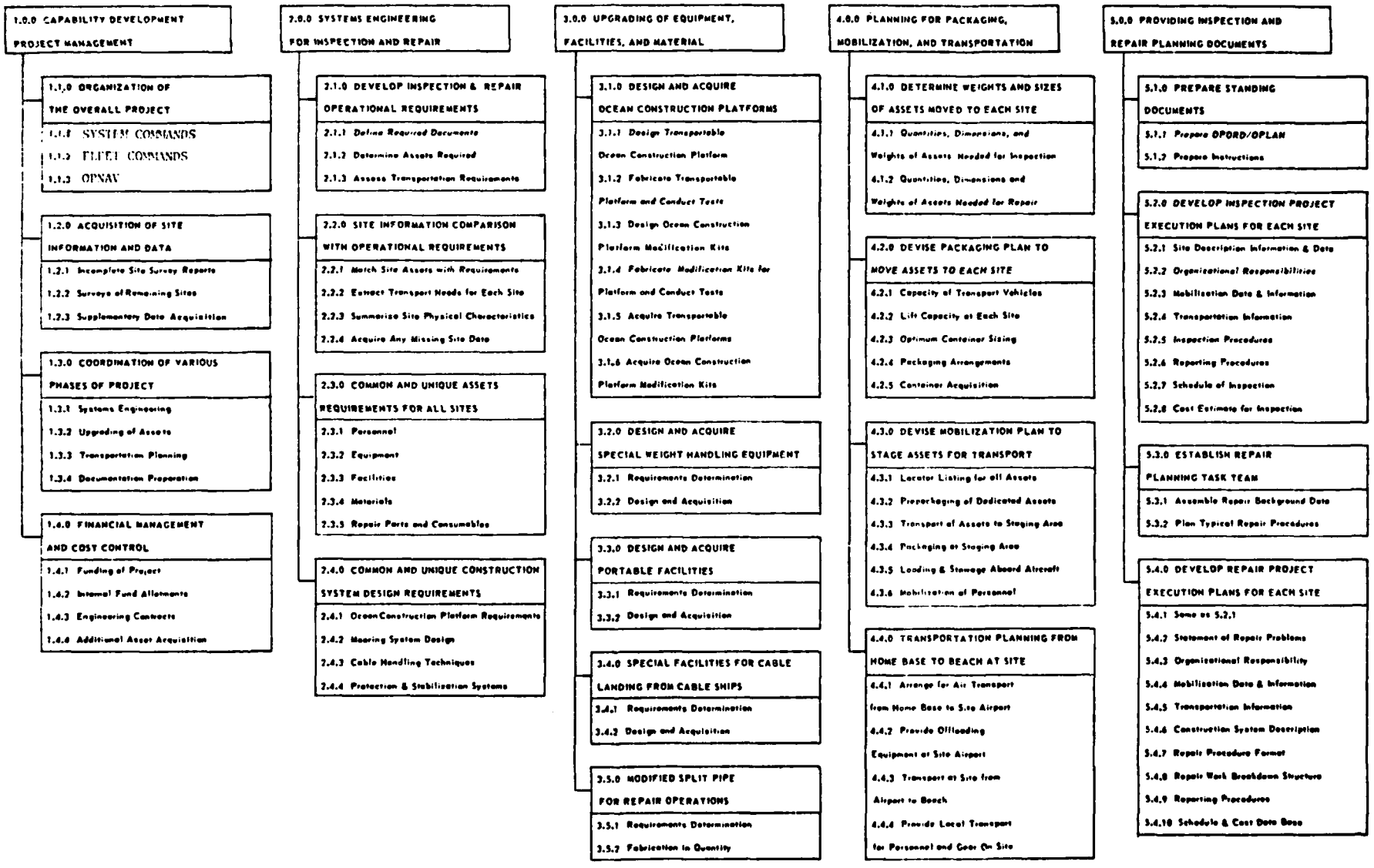
1.1.0 ORGANIZATION OF THE OVERALL PROJECT

1.1.1 System Commands

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - The project manager designed to implement this plan is Code PC-2 of the Naval Facilities Engineering Command with technical staff support provided by Code FPO-1 of the Chesapeake Division of NAVFACENGCOM. Coordinate overall plan and identify

LOGISTICS SUPPORT PLAN
WORK BREAKDOWN STRUCTURE

FIGURE 7



specific SYSCOM involvement. This task will require meetings with NAVELEXSYSCOM, NAVFACENGCOM (Code 06), Naval Sea Systems Command (NAVSEASYSCOM), and Naval Supply Systems Command (NAVSUPSYSCOM) to delineate input requirements.

1.1.2 Fleet Commands

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - Identify to fleet commands the overall participation and specific fleet activity involvement. Fleet commands will designate points of contact.

1.1.3 Office of the Chief of Naval Operations

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - Implementation of this plan as a Navy document requires that the project manager obtain endorsement at this OPNAV level. The plan will be transmitted to OPNAV-04 to obtain this endorsement before proceeding.

1.2.0 ACQUISITION OF SITE INFORMATION AND DATA

1.2.1 Incomplete Site Survey Reports

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution-UCT ONE and UCT TWO; Task - By letter, CHESNAVFACENGCOM, FPO-1 request UCT ONE and UCT TWO complete and forward site survey reports for site that have been routinely inspected but not reported on.

1.2.2 Surveys of Remaining Sites

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Visit sites that have never been surveyed to determine the on-site support that is available. Gather as much on-site support data and information as possible in accordance with reference (j). This task can be implemented by letters to COMOCEANSYSLANT and COMOCEANSYSPAC requesting that a CHESNAVFACEGCOM representative be allowed to conduct on-site support availability surveys at sites, which have never been surveyed.

1.2.3 Supplementary Data Acquisition

Responsibility - NAVELEXSYSCOM; Execution - UCT ONE and UCT TWO; Task - At the direction of NAVELEXSYSCOM, the UCT will conduct underwater cable surveys at sites that have not been surveyed. Specifically, the UCT will establish baselines and chart cable routes. In addition, the UCT will conduct maintenance inspections of undersea cable systems when directed by NAVELEXSYSCOM.

1.3.0 COORDINATION OF VARIOUS PHASES OF PROJECT

1.3.1 Systems Engineering

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - Systems engineering involves basically an analysis of the elements involved in conducting the operation and comparing these with corresponding elements related to the environment in which the operation is to be carried out. The output

of this analysis determines the follow-on processing of the logistics support plan. The management task is to ensure that the overall program is scheduled and costed to account for this and that systems engineering output is transferred in a timely manner to provide input to succeeding steps in the process.

1.3.2 Upgrading of Assets

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - personnel, equipment, facilities, and material; except in the personnel area, there are assets that must be improved or new assets designed and acquired to carry out this program. The management function is to assure that all of these program elements are assigned, processed, and completed to meet the project schedule and cost limitatons and to provide all data needed for operations planning and documentation. It has previously been concluded that the UCT personnel are adequately trained and possess the necessary skills for these operations. However, these skills should be maintained at their current levels and additonal training should be provided for use of any new or revised equipment introduced by this program.

1.3.3 Transportation Planning

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, Code 06; Task - The management aspects of transportation planning involve the integration of the elements of packaging plans and mobilization plans into the transportation function both

for overseas and for on-site movement of men and equipment. This includes both those assets that are available and the new assets being designed and acquired. Furthermore, it requires assuring that transporation constraints will be given full consideration in all acquisitions.

1.3.4 Documentation Preparation

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - Management of document preparation is particularly crucial with regard to those documents such as OPORDs or OPLANs that involve interfacing with other Naval activities. It is important that the resulting documents consider all facets of these interrelationships and it is a management function to see that all critical inputs are given due weight. Similarly, the development of operations procedures requires careful review and the establishment of a repair task team requires management support.

1.4.0 FINANCIAL MANAGEMENT AND COST CONTROL

1.4.1 Funding of Project

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - Identify funding sources for all phases of this plan. Arrange for funds to be made available as they are required for internal operations, for outside study contracts, and for hardware procurements.

1.4.2 Internal Fund Allotments

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - Allocate funds for CHESNAVFACENGCOM, FPO-1 and UCT participation throughout this project.

1.4.3 Engineering Contracts

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - CHESNAVFACENGCOM, FPO-1 will develop cost estimates and initiate engineering contracts needed for systems and operations analyses, design and testing of major components, and for the development of supporting documentation.

1.4.4 Additional Asset Acquisition

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, PC-2; Task - Provide contractual services in support of the technical plans and specifications required for the procurement of adequate equipment, facilities, materials, spare parts, and consumables to meet the requirements evolving from this plan. These assets are to be positioned in the CHESNAVFACENGCOM, FPO-1 Ocean Construction Equipment Inventory or at UCT ONE or UCT TWO as appropriate.

5.3 LOGISTICS SUPPORT PLAN -- 2.0.0 SYSTEMS ENGINEERING FOR INSPECTION AND REPAIR

2.1.0 DEVELOP INSPECTION AND REPAIR OPERATIONAL REQUIREMENTS

2.1.1 Define Required Documents

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - Earlier in the development of this plan a typical inshore cable inspection and repair was outlined. In

order to be able to undertake such an operation within a short time span it is essential that much of the advance planning be done and available in the form of standing documents including coordinating orders and plans for moving assets to the site with minimal delay. These documents include OPORDs or OPLANs and Project Execution Plans covering all these elements that can be foreseen for any operation at any site. The purpose of this specific task is to delineate in detail what the content of these standing documents shall be in order that they may be developed during the course of this project.

2.1.2 Determine Assets Required

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - For any site, determine the personnel, equipment, facilities, material, critical spares, repair parts and consumables required for both an inspection and a repair operation. The output of this task is a set of listings of the above requirements for each site.

2.1.3 Assess Transportation Requirements

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Transit has previously been defined as the movement of all personnel, equipment, facilities, and materials from the home base to the beach where the cable repair is to be effected. Time constraints have also been imposed upon the overall operation. Knowing the assets to be transported and the time allowable for air, land, and sea transport, this task involves developing a set of guidelines to define the trans-

portation requirements so that decisions can be made as to the type of transportation that will be used, limitations on cost and time, use of local vehicles versus carrying transport vehicles from the home base, and also a general listing of quantities, weights, and volumes so that overall capacities of transport can be ascertained.

2.2.0 SITE INFORMATION COMPARISON WITH OPERATIONAL REQUIRMENTS

2.2.1 Match Site Assets with Requirements

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Utilizing the site information and data base and the foregoing analysis of operational requirements, and the assets required for inspection, compare repair operations with the availability of assets at each site. The output of this task is a list for each site of personnel, equipment, facilities, material, critical spares, repair parts, and consumables that must be mobilized and transported to a site in the event of a cable casualty report.

2.2.2 Extract Transport Need for Each Site

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Utilizing the site information and date base, and the transportation guidelines developed above, determine if each site has the required vehicles and weight handling equipment to transport assets to the beach site. The result of this task shall be a series of working papers identify-

ing specific on-site transportation problems to be addressed in preparing the transportation plan for each site.

2.2.3 Summarize Site Physical Characteristics

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - For each site prepare a detailed description of the physical characteristics, including road maps and contour maps of the inshore cables, details of the terrain characteristics, both onshore and inshore, descriptions of weather patterns, sea conditions, currents, tides, and all details that could affect the conduct of an inshore operation. The output of this task will be the site description information and data required for the inspection and repair project execution plans in Task 5.2.1 and 5.4.1 as well as data required for designing ocean construction platforms, mooring systems, and for transportation planning.

2.2.4 Acquire Any Missing Site Data

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Where any information or data needed for ongoing developments in the program are identified as missing, this task shall be instituted to acquire those data so that the descriptions of 2.2.3 can be completed to the required degree of detail. To the extent possible, these data will be obtained through COMOCEANSYSLANT and COMOCEANSYSPAC from personnel already on site and from available

hydrographic and oceanographic data sources. However, if necessary, representatives shall be sent to these sites to ensure that all necessary information is on hand.

2.3.0 COMMON AND UNIQUE ASSETS REQUIREMENTS FOR ALL SITES

2.3.1 Personnel

Responsibility - NAVFACENGCOM, PC-2; Execution - CHES-NAVFACENGCOM, FPO-1; Task - Develop a basic list of personnel and their qualifications that will be required for inspection and repair operations at any site where a casualty may occur. For individual sites, with minimal personnel assets, indicate the additional personnel required to be transported from UCT ONE and UCT TWO to support the operations.

2.3.2 Equipment

Responsiblity - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Develop a list of equipment that is available in homeport or on-site and common to an inspection and repair at all sites. Develop a list of equipment that is unavailable in homeport or on-site but required for an inspection and repair at each specific site. These lists will be used as inputs for mobilization planning and for the mobilization data and information in Section 5.4.4.

2.3.3 Facilities

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Develop a list of facilities that are required during an inspection and repair operation and are

available at all sites. Develop a list which identifies facilities deficiencies at specific sites. These deficiencies will form the basis for the portable facilities to be designed and acquired under Section 3.3.0.

2.3.4 Materials

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1 and NAVELEXSYSCOM; Task - Develop a list of common cable and split pipe requirements. This list shall define the anticipated quantities of cable and split pipe that must be available in inventory in the event of a cable casualty. The project manager is responsible for coordinating these requirements with NAVELEXSYSCOM to insure that cable and split pipe are available in inventory.

2.3.5 Repair Parts and Consumables

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVSUPSYSCOM and Civil Engineer Support Office (CESO); Task - Utilizing the list of equipment that is common to all inspection and repair operations, develop Combined Seabee Allowance Lists (COSALS) which identify and stock required repair parts and consumables in the Navy inventory.

2.4.0 COMMON AND UNIQUE CONSTRUCTION SYSTEM DESIGN REQUIREMENTS

2.4.1 Ocean Construction Platform Requirements

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - A primary objective of this plan is to have an ocean construction or work platform available. A true readiness capability necessitates that the work platform

be obtainable from Navy assets. Currently, a work platform is available in Keflavik, Iceland. At other sites, marine vehicles are potentially available from fleet activities in the immediate vicinity of the site. This task is concerned with analyzing the site information and data, including equipment availability information, transportation information, and environmental data to establish the basic requirements for one or more types of ocean construction platforms. Utilizing the acquired data, determine sites at which an ocean construction platform is actually required. Develop a list ranking preferred platforms for each site. The output of this task shall be an analytical report describing the overall requirement for submission to the project manager. The project manager, in turn, shall investigate marine vehicle availability with OPNAV, SYSCOMs, and with Fleet Commands to establish the optimum mix of modified vessels or conversions that will fulfill the requirements. These requirements will then be turned over to the project staff for design and acquisition of ocean construction platforms or modification kits as delineated in Section 3.1.0.

2.4.2 Mooring System Design

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop a series of standard mooring system designs for ocean construction platforms to hold them in a working position in the various depths, bottom con-

ditions that may be encountered during inshore undersea cable repairs. Convert the results to tabular form so that with a given set of input conditions the mooring configuration can be derived and all of the systems elements can be selected and ordered for a specific operation.

2.4.3 Cable Handling Techniques

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Prepare a document which summarizes the existing Navy knowledge on inshore cable handling techniques. The document shall contain cable and split pipe specifications; techniques and potential problems encountered in landing a cable replacement section from a cable ship; techniques for raising cable ends from the sea floor; techniques for protecting and stabilizing inshore cables; data on lifting capacities of cable flotation devices; working capacities of typical rope used in repair operations; and any information, data and graphs which could be useful in planning a cable repair operation. The documents shall contain and evaluate information on cable handling techniques now in use by private industry worldwide. This task will document techniques for use in training personnel and provide background data useful to the repair planning task team in the event of a cable casualty.

2.4.4 Protection and Stabilization Systems

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - The present capability to protect

and stabilize inshore undersea cable systems consists of split pipe and associated hardware, rock bolts and U-rods. New techniques for protecting and stabilizing inshore undersea cable systems are being employed in the Barking Sands, Underwater Range Expansion (BSURE) Project. Perform an underwater inspection to evaluate the new techniques used in the BSURE Project. The result of this effort shall be a report evaluatting the new techniques and identifying the applicability of these new techniques for the sites addressed in this plan. The project manager shall coordinate the execution of this task with the Pacific Missile Test Center (PMTC).

5.4 LOGISTICS SUPPORT PLAN -- 3.0.0 UPGRADING OF EQUIPMENT, FACILITIES, AND MATERIAL

3.1.0 DESIGN AND ACQUIRE OCEAN CONSTRUCTION PLATFORM

3.1.1 Design Transportable Ocean Construction Platform

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-NAVFACENGCOM, FPO-1; Task - If it is determined that a transportable ocean construction platform will be required for one or more sites (Section 2.4.1), this task is established to cover the design aspects. It is anticipated that the platform will be a basic Navy craft, such as an LCVP, that will fit into an aircraft and which can be equipped with supplemental flotation and stabilization elements and air compressors so that it can be assembled on site into a work platform for handling and splicing cable and for applying split pipe.

Because of size constraints this will be a minimally satisfactory platform and the modification design will require a thorough understanding of the working environment and of the work to be performed.

3.1.2 Fabricate Transportable Platform and Conduct Tests

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - Contractor, UCT ONE, and UCT TWO; Task - A suitable Navy craft will be acquired and fitted with fixed equipment and with fittings to attach supplemental flotation and stabilization units. These units will be fabricated and installed on the craft for a thorough testing of its working capability and also of its transportability and ease of on-site assembly. The testing of the platform will be performed by both UCT ONE and UCT TWO personnel and will serve as a training unit to ensure the capability to utilize it on site.

3.1.3 Design Ocean Construction Platform Modification Kit

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - It is anticipated that a number of cable facilities will have access to a standard Navy craft that can be converted when required and used as an ocean construction platform for a cable repair. In order to expedite such conversions and to provide a standardized platform for cable repair activities there should be a consistent means of modifying the

standard craft. This task involves developing a design for a standard modification kit that can be used at each of these sites to convert the existing craft into an acceptable platform. Such a conversion might involve installation of air compressors, cable handling winches, additional decking, split pipe stowage racks, and means of easing the cable aboard and back into the water. The actual requirements for this design will evolve from Section 2.4.1.

3.1.4 Fabricate Modification Kits and Conduct Tests

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - Contractor, UCT ONE, and UCT TWO; Task - Fabricate modification kits and conduct tests aboard marine vehicles intended for use in actual repair operations. The tests shall result in the development of a document which details kit installation procedures and also provides training information for the modification and operation of the unit by the UCT.

3.1.5 Acquire Transportable Ocean Construction Platforms

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Acquire air transportable ocean construction platforms in the quantity prescribed in 2.4.1. The platforms shall be physically located at UCT ONE and UCT TWO for ready transport to repair sites as needed.

3.1.6 Acquire Ocean Construction Platform Modification Kits

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Acquire modification kits and

physically store kits in the UCT inventory for use in the event of inshore undersea cable system casualties.

3.2.0 DESIGN AND ACQUIRE SPECIAL WEIGHT-HANDLING EQUIPMENT

3.2.1 Requirements Determination

Responsibility - NAVFACENGCOM, PC-2; Execution - CHES-NAVFACENGCOM, FPO-1; Task - The systems engineering effort, 2.1.0, will determine requirements for handling equipment and identify the availability of handling equipment at each site. Two alternatives are possible for sites on which the required handling equipment is not available. Either equipment can be pre-positioned at sites where it is required or a weight-handling system can be designed which can be used in conjunction with other equipment available on site. Dedicating a large crane at a site may not be as cost effective as designing a weight-handling system which can be used in conjunction with a smaller traction source and other weight-handling system elements.

3.2.2 Design and Acquisition

Responsibility - NAVFACENGCOM, CODE 06; Execution - NAVFACEN-GCOM, Code 06; Task - Design and acquire weight-handling equipment required for advanced base cable repair activities. The resulting hardware shall be stored in the UCT ONE and UCT TWO inventories.

3.3.0 DESIGN AND ACQUIRE PORTABLE FACILITIES

3.3.1 Requirements Determination

Responsibility - NAVFACENGCOM, PC-2, Execution - CHES-

NAVFACENGCOM, FPO-1; Task - The systems engineering effort, Section 2.3.3, will identify requirements for portable facilities that have to be transported with the UCT for a repair operation. Examples of these portable facilities include vans for maintenance and administrative use during operations and also diver life support facilities. The purpose of this task is to develop the requirements for portable facilities that can be transported with the UCT to any site. CHESNAVFACENGCOM will develop requirements for portable facilities for other than life support whereas NAVSEASYSCOM will develop requirements and specifications for portable diver life support facilities.

3.3.2 Design and Acquisition

Responsibility - CHESNAVFACENGCOM, FPO-1 and NAVSEASYSCOM; Execution - Contractor; Task - CHESNAVFACENGCOM, FPO-1 shall contract for the design and acquisition of portable facilities other than diver life support. NAVSEASYSCOM shall contract for the design and acquisition of portable diver life support facilities.

3.4.0 SPECIAL FACILITIES FOR CABLE LANDING FROM CABLE SHIPS

3.4.1 Requirements Determination

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - The typical repair operation in this plan identified an immediate requirement for a capability to land a replacement cable section from a cable ship. The typical repair operation described a shore-based system of poles and lights which provided alignment reference for a cable ship. The purpose of this task is to develop require-

ments for a system that will improve the present capability to land a replacement cable section from a cable ship.

3.4.2 Design and Acquisition

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - Design and acquire the required cable landing system and stock it in the CHESNAVFACENGCOM Ocean Construction Equipment Inventory.

3.5.0 MODIFIED SPLIT PIPE FOR REPAIR OPERATIONS

3.5.1 Requirements Determination

Responsibility - NAVFACENGCOM, PC-2; Execution - CHESNAVFACENGCOM, FPO-1; Task - The typical repair operation previously described identifies an immediate requirement for special split pipe sections with varying end configurations. The purpose of this task is to develop the requirement for those modified split pipe sections that may be needed for any given repair operation.

3.5.2 Fabrication in Quantity

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - UCT ONE and UCT TWO; Task - CHESNAVFACENGCOM, FPO-1 will transmit modification requirements and funds to both UCT ONE and UCT TWO. The UCT will fabricate special split pipe end configurations.

5.5 LOGISTICS SUPPORT PLAN -- 4.0.0 PLANNING FOR PACKAGING, MOBILIZATION AND TRANSPORTATION

4.1.0 DETERMINE WEIGHTS AND SIZES OF ASSETS MOVED TO EACH SITE

4.1.1 Quantities, Dimensions, and Weights of Assets Needed for Inspection

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - For each site, determine quantities, dimensions, and weights of equipment, repair parts and consumables needed for an inspection. List these data under a variety of categories to enable selection of the optimum composition of packaging units for a given operation.

4.1.2 Quantities, Dimensions and Weights of Assets Needed for Repair

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - For each site, determine quantities, dimensions and weights of equipment, materials, repair parts and consumables needed for a repair. List these data under a variety of categories so that a logical and efficient selection may be made for dividing the total assets into containerized quantities that can be handled efficiently.

4.2.0 DEVISE PACKAGING PLAN TO MOVE ASSETS TO EACH SITE

4.2.1 Capacity of Transport Vehicles

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - The mobilization and transporation plans will identify available vehicles and craft for transporting

inspection and repair equipment, material, repair parts, and consumables from the home base to the beach at the cable repair site. For the identified vehicles and aircraft, determine the working cargo capacities.

4.2.2 Lift Capacity at Each Site

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Determine the lift capacity of weight-handling equipment at each site for use both in moving equipment off aircraft and for depositing equipment on the beach.

4.2.3 Optimum Container Sizing

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Utilizing the results of tasks 4.2.1 and 4.2.2 optimize the size of containers for stowing gear aboard aircraft and for loading and offloading at home base and at cable repair sites.

4.2.4 Packaging Arrangements

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Develop container loadout lists for inclusion in project execution plans. Identify container quantities sizes, and loaded weights for transport to each site.

4.2.5 Container Acquisition

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Potentially there will be a degree of container commonality for all sites. The purpose of this task

inspection and repair equipment, material, repair parts, and consumables from the home base to the beach at the cable repair site. For the identified vehicles and aircraft, determine the working cargo capacities.

4.2.2 Lift Capacity at Each Site

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Determine the lift capacity of weight-handling equipment at each site for use both in moving equipment off aircraft and for depositing equipment on the beach.

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4.2.4 Packaging Arrangements

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Develop container loadout lists for inclusion in project execution plans. Identify container quantities sizes, and loaded weights for transport to each site.

4.2.5 Container Acquisition

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Potentially there will be a degree of container commonality for all sites. The purpose of this task

shall be to acquire two sets of containers that are suitable for transport to any site. The containers shall be positioned at UCT ONE and UCT TWO.

4.3.0 DEVISE MOBILIZATION PLAN TO STAGE ASSETS FOR TRANSPORT

4.3.1 Locator Listing for all Assets

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - The purpose of this task is to develop a readiness capability to remove assets rapidly from home base stowage, pack the assets in containers, and load and store the containers aboard aircraft for transport to a site. Develop a list for inclusion in inspection and repair project execution plans that identifies the physical location of assets for both inspection and repair. The list shall provide the input information required for Sections 5.2.3 and 5.4.4.

4.3.2 Prepackaging of Dedicated Assets

Responsibility - NAVFACENGCOM, PC-2; Execution - UCT ONE, UCT TWO, NAVELEXSYSCOM; Task - As a result of the systems engineering effort and coordination between participants, critical spare equipment and repair parts are available in inventories. Also, cable and split pipe are available in inventory. UCT shall prepackage all dedicated critical spare equipment, and repair parts. NAVELEXSYSCOM will have cable and split pipe stored in inventory for ready shipment in the event of a cable casualty.

4.3.3 Transport of Assets to Staging Area

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Develop a plan for weight-handling equipment and vehicles to be available for transport from the physical location of the assets to the staging area. Prepare data and information for inclusion in inspection and repair project execution plans (Sections 5.2.3 and 5.4.4).

4.3.4 Packaging at Staging Area

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Military Airlift Command (MAC); Task - Develop a sequence for packing assets into containers. Coordinate effort with military air transport commands and identify requirements for coordinating instructions.

4.3.5 Loading and Stowage Aboard Aircraft

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Military Airlift Command (MAC); Task - Develop a plan for sequencing container loading and stowage aboard aircraft. Coordinate plan with military air transporation commands and identify requirements for coordinating instructions.

4.3.6 Mobilization of Personnel

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Identify the number of UCT personnel and skill requirements to be mobilized for an inspection and repair at each site. This task shall provide input information for Sections 5.2.3 and 5.4.4.

4.4.0 TRANSPORTATION PLANNING FROM HOME BASE TO BEACH AT SITE

4.4.1 Arrange for Air Transport from Home Base to Site Airport

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Military Airlift Command (MAC); Task - Make arrangements for air transport of assets from home base to site airport. Identify requirements for the development of coordinating instructions. Develop transportation information for inclusion in inspection and repair project execution plans (Sections 5.2.4 and 5.4.5).

4.4.2 Provide Offloading Equipment at Site Airport

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Provide handling equipment for offloading assets at site airport for all 23 sites. Details on the equipment available are to be prepared for inclusion in the inspection and repair project execution plans (Sections 5.2.4 and 5.4.5).

4.4.3 Transport at Site from Airport to Beach

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Make arrangements to have vehicles available to transport assets from airport to beach and provide pertinent data for the inspection and repair project execution plans.

4.4.4 Provide Local Transport for Personnel and Gear on Site

Responsibility - NAVFACENGCOM, PC-2; Execution - NAVFACENGCOM, (06); Task - Make arrangements for the availability

of vehicles at each site for both overland and water transport of personnel and gear during the conduct of inspection and repair operations. Provide pertinent input data for the inspection and repair project execution plans.

5.6 LOGISTICS SUPPORT PLAN -- 5.0.0 PROVIDING INSPECTION AND REPAIR PLANNING DOCUMENTS

5.1.0 PREPARE STANDING DOCUMENTS

5.1.1 Prepare OPLAN/OPORD

Responsibility - CBLANT, CBPAC; Execution - CHESNAVFACENGCOM, FPO-1; Task - Prepare an OPLAN or OPORD specifically for inshore undersea cable systems repair. It is recommended that the document contain the inspection and repair project execution plans developed in Sections 5.2.0 and 5.4.0 of this work breakdown structure.

5.1.2 Prepare Instructions

Responsibility - To be identified; Execution - CHESNAVFACENGCOM, FPO-1; Task - As a result of this plan it may be necessary to prepare Navy Instructions for the availability of an ocean construction platform, mobilization and transportation of equipment, personnel, facilities, materials, repair parts, and consumables. Prepare necessary instructions as required.

5.2.0 DEVELOP INSPECTION PROJECT EXECUTION PLANS FOR EACH SITE

5.2.1 Site Description, Information and Data

Responsibility - CHESNAVFACENGCOM, FPO-1, Execution - CHESNAVFACENGCOM, FPO-1; Task - Describe the shore site including a narrative surveyors'

plot plan, and a photograph. The narrative should be a brief description of the terrain, type of ground cover, ground type and significant landmarks. The surveyors' plot plan should be a scale drawing showing shore and seaward cables routes, buildings, and landmarks. The photographs should be a panoramic view of the beach and facility. In addition, the site description should include a narrative covering the on-site availability of equipment, transportation, heavy construction platforms, messing and berthing, shop services, recompression facilities, medical services, recreational facilities, and weather information. A telephone list of the on-site facilities should be included and references to previous inspection and repair operations.

5.2.2 Organizational Responsibilities

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop organizational charts for either UCT ONE or UCT TWO performing an inspection at any site. Detail the responsibilities of the commands shown in the organizational charts.

5.2.3 Mobilization Data and Information

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - For either UCT performing an inspection at any site describe the equipment, personnel, critical repair parts, and consumables that have to be mobilized; container type, and

load-out list for each container; weight-handling equipment and vehicles required, and points of contact with telephone numbers to request weight-handling equipment and vehicles. This data and information will be a result of the mobilization and packaging plans developed in Sections 4.2.0 and 4.3.0.

5.2.4 Transportation Information

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - For either UCT performing an inspection at any site, describe the homeport and on-site procedures for requesting transportation including points of contact with telephone numbers and Navy message requirements. This information will be an output of the transportation plans developed in Section 4.4.0 and will include all relevant information on carrier types, capacities, and schedules.

5.2.5 Inspection Procedures

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - The purpose of the inspection is to identify the problem and provide sufficient data and information to develop an approach to effecting a cable repair. This task should include preparation of an inspection procedure for each site and specify the type and amount of data and information to be gathered.

5.2.6 Reporting Procedures

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop formats and plotting charts which describe the problem and organize the data and information obtained during the inspection so that they can be readily assimilated by the task team involved in planning the repair procedure.

5.2.7 Schedule of Inspection

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop a schedule of events for an inspection at each site.

5.2.8 Cost Estimate for Inspection

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop cost estimates to perform an inspection at each site by either UCT.

5.3.0 ESTABLISH REPAIR PLANNING TASK TEAM

5.3.1 Assemble and Prepare Background Data

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - On a rotating basis, FPO-1 will designate a task team which in the event of cable casualty is prepared to develop a repair project execution plan. It is recommended that the task team be made up of the CHESNAVFACENGCOM CAESAR Project Officer, one engineer, and clerical support. During interim periods, when this task team is unoccupied with planning repair procedures, an ongoing task is to develop a background file of equipment drawings and repair technique procedures that can be utilized when a casualty does occur.

5.3.2 Plan Typical Repair Procedures

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1 (Repair Planning Task Team); Task - The purpose of this task is to take a "quick look" at a potential cable repair situation at each site and anticipate major problems that might occur. For example, it may not be feasible to tow a replacement cable section from the beach at a parti-

cular site; landing cable from a cable ship might be the only solution. Working papers shall be prepared on unique cable repair requirements at each site. This task should be performed by the task team engineer with the support of the task team typist.

5.4.0 DEVELOP REPAIR PROJECT EXECUTION PLAN FOR EACH SITE

5.4.1 Site Description, Information and Data

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1: Task Same as Section 5.2.1.

5.4.2 Statement of Repair Problems

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1 (Repair Planning Task Team); Task - After a cable casualty and as a result of the cable inspection, the specific repair problems will be delineated in terms of environment, equipment and facility limitations, transportation delays, and any other problems that are related to the specific repair operation to be undertaken.

5.4.3 Organizational Responsibilities

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task Develop organizational charts for either UCT performing a repair at any site. Detail the responsibilities of the commands shown in the organizational charts.

5.4.4 Mobilization Data and Information

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task For either UCT performing a repair at any site describe the equipment, personnel, repair parts, and consumables that have

to be mobilized; define container type and load-out list for each container; list weight-handling equipment and vehicles required; indicate points of contact (with telephone numbers) to request weight-handling equipment and vehicles. This information will be an output of the packaging and mobilization plans. Cable quantity and protection and stabilization system element quantities and sizes are functions of specific repair requirements. These requirements will be identified after the cable inspection and included in the repair project execution plan by the repair planning task team.

5.4.5 Transportation Information

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - For either UCT performing a repair at any site decribe the homeport and on-site procedures for requesting transportation including points of contact with telephone numbers and Navy message requirements. This information will be a result of the transportation plans developed in Section 4.4.0 and will include all relevant information on carrier types, capacities, and schedules.

5.4.6 Construction System Description

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAV-FACENGCOM, FPO-1 (Repair Planning Task Team); Task - The ocean construction platform availability and modification plan will result in a platform being available at each site, a procedure for modifying the platform, deck-layouts and a mooring design for the

platform. These will be included in the project execution plan for each site together with descriptions of any weight-handling equipment, cable handling techniques, construction system vehicles, or any facilities that are unique to a particular site.

5.4.7 Repair Procedure Format

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAV-FACENGCOM, FPO-1 (Repair Planning Task Team); Task - Develop a format or outline for describing a repair procedure noting unique features that must be considered for specific sites.

5.4.8 Repair Work Breakdown Structure

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAV-FACENGCOM, FPO-1 (Repair Planning Task Team); Task - Develop a work breakdown structure by organization. This may be modified for an actual repair by perhaps adding another command or contractor but should otherwise be sufficiently generalized to apply to an inshore undersea cable repair at any of the 23 sites.

5.4.9 Reporting Procedures

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAVFACENGCOM, FPO-1; Task - Develop a sample situation report (SITREP) format to be utilized during field operations. Also develop an outline for a project completion report.

5.4.10 Scheduling and Cost Data Base

Responsibility - CHESNAVFACENGCOM, FPO-1; Execution - CHESNAV-FACENGCOM, FPO-1; Task - Develop a set of data on the time required to mobilize and transport a repair team to each of the 23 sites; also gather data on time required for performing repair operations of varying degrees of difficulty including a range of environ-

mental conditions under which they might be performed. Develop similar data on all of the associated cost elements for performing a repair operation. These data should be in sufficient details so that a specific operation can be scheduled and costed out with a minimum amount of effort in an emergency situation and the results included in the project execution plan for that repair operation.

6.0 SCHEDULE AND COST

6.1 GENERAL CONSIDERATION OF TIME AND COST FACTORS

Earlier, in Section 5.1, it was demonstrated that the execution of this Logistics Support Plan for Inshore Undersea Cable Systems Repair falls logically into three broad phases. Furthermore, these phases are rational divisions of the Work Breakdown Structure of Figure 7. This division of effort is summarized below:

Phase I: Establishment of Program and Requirements Analysis

- o WBS 1.0.0 Capability Development-Project Management
- o WBS 2.0.0 Systems Engineering for Inspection and Repair

Phase II: Upgrading of Assets and Advance Planning

- o WBS 3.0.0 Upgrading of Equipment, Facilities, and Material
- o WBS 4.0.0 Planning for Packaging, Mobilization, and Transporation

Phase III: Documentation of Orders, Responsibilities, and Procedures

- o WBS 5.0.0 Providing Inspection and Repair Planning Documents

As stated previously, much of the work to be performed in Phases II and III is dependent upon the outcome of the Phase I effort, particularly with regard to what is revealed by the data and information acquired and the systems engineering analyses that are performed in Phase I. For this reason it would be overly optimistic to anticipate either the schedules or costs involved in Phases II and III until the Phase I effort is well underway.

6.2 SCHEDULE AND COST FOR THE PHASE I EFFORT

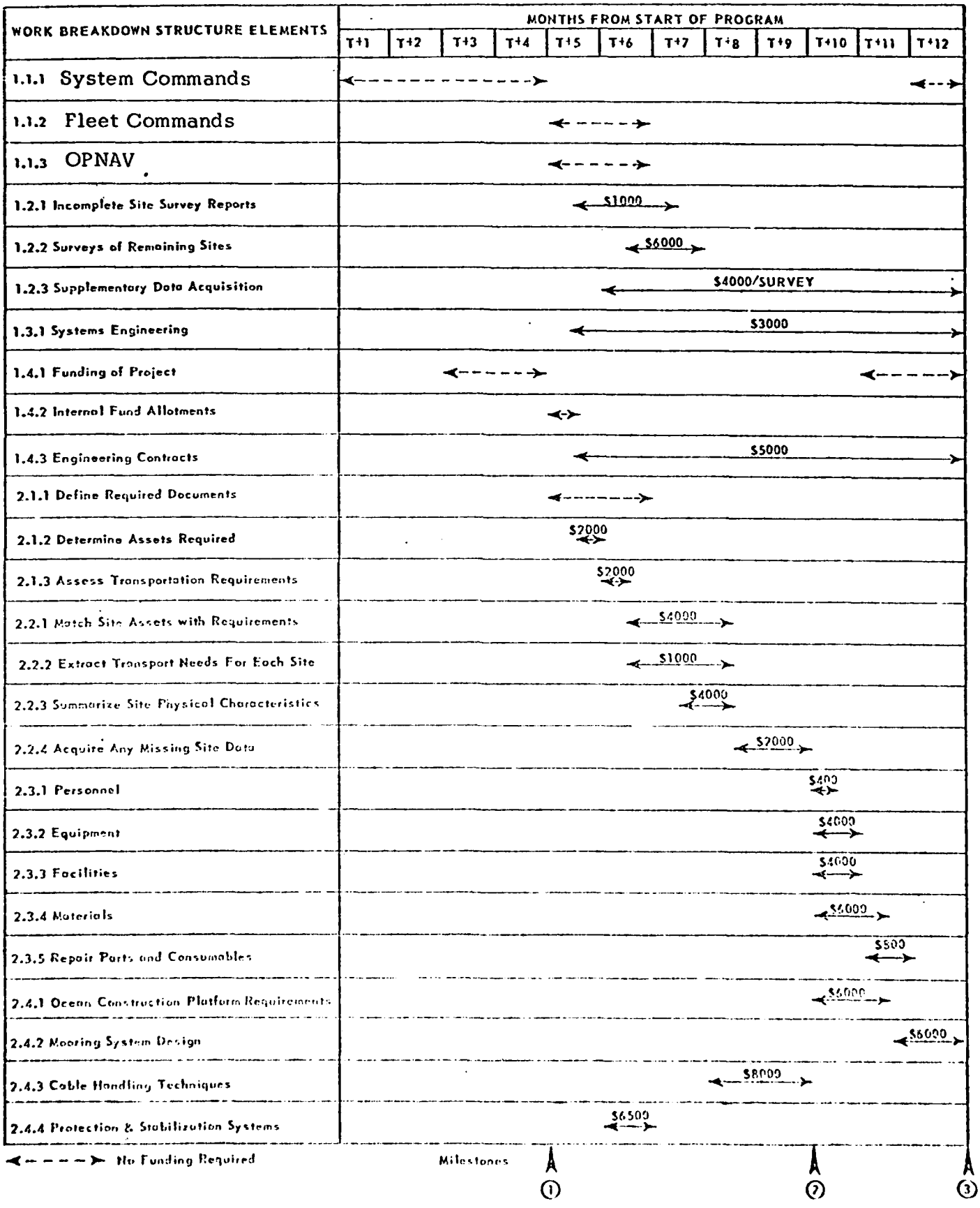
Some of the Phase I work has already been completed. Other elements involving site surveys have been done but are as yet unreported, and other work elements remain to be accomplished. As a result, both the schedule and cost of these first two major divisions of the Work Breakdown Structure still require authorization for completion and assignment of funds. The work involved is delineated under Sections 1.0.0 and 2.0.0 of the Work Breakdown Structure, Figure 7. The cost and time required for this first phase of the total effort is outlined in Figure 8. Estimation of the overall time and cost for completion of Phases II and III of the project will be worked out under Section 1.4.1 of the Work Breakdown Structure.

The major milestones to be attained are indicated on Figure 8; the objectives to be reached at these points are as follows:

- Milestone 1 - End of fourth month - Funding obtained for Phase I of the project.
- Milestone 2 - End of ninth month - Information and data base complete and comparison of site data with operational requirements accomplished.

ESTIMATED SCHEDULE AND COST FOR PHASE I
LOGISTICS SUPPORT PLAN FOR INSHORE CABLE SYSTEMS REPAIR

FIGURE 8



- o Milestone 3 - End of twelfth month - Systems engineering for inspection and repair completed; costing and scheduling of Phase II and III completed and funds obtained.

Thus, it is estimated that the total Phase I effort can be completed in a twelve month period at a total cost of $71,700.00 plus $4,000.00 for each additional site survey authorized by NAVELEXSYSCOM.

APPENDIX A

REFERENCES

REFERENCES

(a) COMNAVELEXSYSCOM (C) ltr 11019/3 Ser 096 PME 124-61 of 14 Sep 1972, "Naval Construction Force Underwater Construction Capabilities; requirements for"

(b) CINCPACFLT (C) ltr 11010 Ser 43/01234 of 14 Dec 1972, "Naval Construction Force Support of Underwater Surveillance Systems"

(c) CINCLANTFLT (C) ltr 11005 Ser 046/92 of 17 Jan 1973, "Naval Construction Force Support of Underwater Surveillance Systems"

(d) CNO msg 231725Z Oct 1973, "Establishment of Underwater Construction Teams One and Two"

(e) CNO (OP-44) ltr of 27 Nov 1973, "Naval Construction Force Support for NAVELEX Projects"

(f) NAVFACENGCOM ltr PC-2/WJE of 25 Feb 1974

(g) COMCBLANT msg 132030Z Feb 1975, "COMCBLANT OPLAN NO. 3000"

(h) COMCBPAC msg 101930Z July 1974, "COMCBPAC OPORD 3-74"

(i) NAVFACENGCOM ltr PC-22/EBS of 22 Sept 1975

(j) CHESNAVFACENGCOM, Underwater Cable System Inspection Criteria, May 1975

Reference (a)*

*NOTE: The available copy of reference (a) was of such poor quality that reference (a) has been retyped for the convenience of the reader.

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APPENDIX B

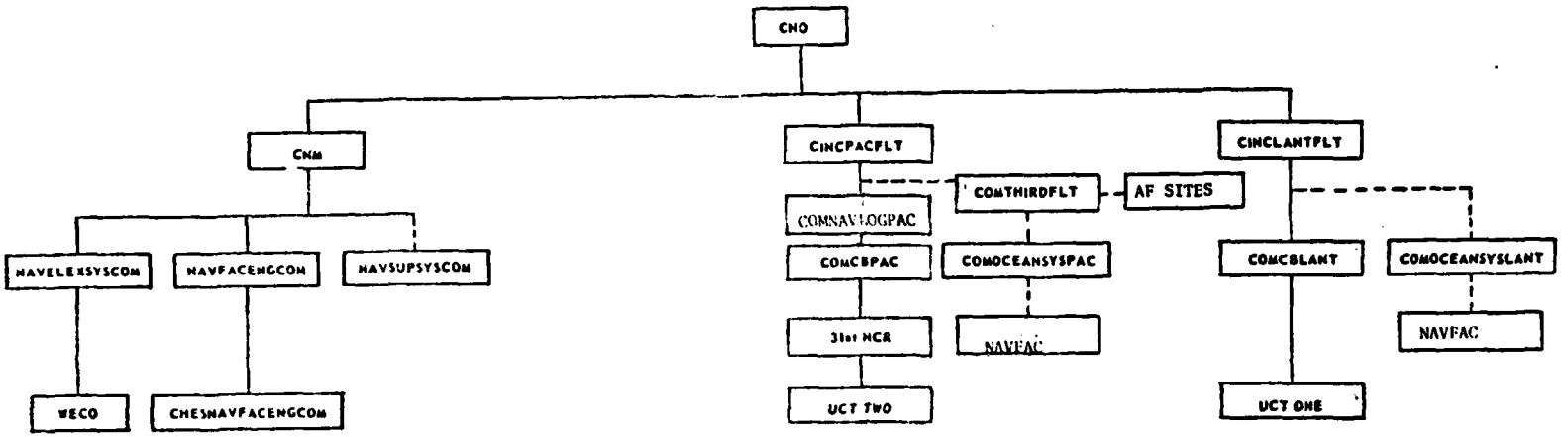
INSPECTION OPERATION ANALYSIS

INSPECTION OPERATIONS ANALYSIS								
PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Readiness	D-1	1. A state of readiness prior to a cable casualty report.	1. Command relations prior to a casualty report. (See Figure 2)	1.(P)* Lack of coordination between involved participants. (D)** No standing document specifically for inshore undersea cable repairs.				
Mobilization	D	1. Cable casualty report.	1. Command organization is shown in Figure 5.	1.(P) Difficulty in rapidly mobilizing an inspection team for a specific site. (D) No methods for rapid mobilization of personnel and equipment to a site.			1. Message from NAVSTA to COSL or COSP, info to NAVELEX.	
		2. Identify funding: cost and source.	2. NAVELEX				2. NAVELEX budget sources.	
		3. Request tasking of UCT and CHESDIV.	3. NAVELEX, CINCLANT or CINCPAC.				3. Message from NAVELEX to CINCLANT or CINCPAC.	
		4. Tasking accepted.	4. CINCLANT or CINCPAC, CBLANT or or CBPAC.				4. Message from CINCLANT or CINCPAC TO CBLANT OR CBPAC.	
		5. Initiate project execution.	5. CBLANT or CBPAC, UCT ONE or UCT TWO.				5. CBLANT or CBPAC passes tasking to UCT ONE OR UCT TWO.	
		6. Arrange transportation to site.	6. UCT, MTO, MSC, MAC, AIRLANT/PAC commercial carriers	6.(P) Difficulty in evaluating transportation alternatives.			6. Message from UCT to military/ commercial carriers.	

*P = Problems
**D = Deficiency created by the problem

COMMAND ORGANIZATION AFTER A CABLE CASUALTY REPORT

FIGURE 5



PARTICIPANTS CONNECTED BY SOLID LINES ARE THE SAME AS IN FIGURE 2.
PARTICIPANTS CONNECTED BY DOTTED LINES ARE THE ORGANIZATIONAL INTERFACES AFTER A CABLE CASUALTY REPORT.

THE ORGANIZATIONAL RESPONSIBILITIES ARE OUTLINED AS FOLLOWS:

- CONAVSTA: INITIATES CABLE CASUALTY REPORT
- COMOCEANSYSLANT/PAC: OPERATIONAL CONTROL OF UNDERSEA CABLE SYSTEMS
- NAVSUPSYSCOM: RESPONSIBLE FOR SUPPLY SUPPORT DURING INSPECTION AND REPAIR OPERATION

INSPECTION OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Mobilization (cont'd)				(D) No central source of specific transportation arrangements for each site.				
		7. Obtain area clearances. 8. Cut orders.	7. UCT, Area Coordinator. 8. UCT				7. Message from UCT to Area Coordinator. 8. UCT travel request to site.	
		9. Pack inspection equipment.	9. UCT	9.(P) Difficulty in identifying specific equipment requirements for each site. (D) No site by site analysis of equipment requirements. No organized information on specific equipment for each site.	9. Inspection equipment packed in 4 tri-wall containers: total vol = 320ft^3 total weight = 4000 lbs	9.(P) Containers oversize for commercial air transport with inspection team. (D) No inventory of containers that meet commerical air transport carry on requirements.		
		10. Ship inspection equipment to site.	10. UCT		10. o Forklift is required to handle 4 tri-wall containers. o Flat bed truck required to transport tri-walls to shipping.	10. (P) Weight handling equipment and vehicles may be committed at the time of a cable casualty report. (D) No mechanism to provide weight handling equipment and vehicles on very short notice .		

INSPECTION OPERATIONS ANALYSIS

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Transit	D+1	1. Inspection team and equipment embark for site.	1. UCT made up of 1 OIC, 1 LPO, 7 UCT divers, 1 CHESDIV rep.		1. Aircraft			
		2. Inspection team arrives at site.	2. Same as #1.		2. Same as #1.			
		3. Customs inspection (if necessary).	3. All UCT.	3. (P) Lack of knowledge about. Customs requirements in foreign countries. (D) No organized information on customs requirements for sites in foreign countries.	3. All inspection equipment.			
	D+2	1. Arrangements: base public works assistance and transportation.	1. OIC, Base PWO and APWO.	1.(P) Lack of familiarity with site. (D) No organized information on sites.	1. Vehicle	1.(P) Vehicle may be committed at the time of a casualty. (D) No mechanism to provide vehicle on very short notice.	1. Meeting	
		2. Briefings	2. OIC, CONAVSTA CO of the FAC.		2. Vehicle		2. Meeting	
		3. Arrangements: berthing, messing, shipping, receiving, purchasing, pay.	3. Enlisted UCT, base supply, base disbursing.		3. Vehicle		3. Meeting	

INSPECTION OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Transit (cont'd)	D+2	4. Move inspection equipment to beach site.	4. UCT, base PW (transportion), base receiving.		4. o Flat bed truck o Forklift o 4 tri-wall containers	4.(P) At specific sites, trucks and forklifts may be either unavailable or unsuitable. (D) No mechanism to provide a truck and forklift on short notice. Alternative weight handling systems not identified.		
	D+3	1. Setup beach site.	1. UCT		1. Inspection equipment.			
		2. Liaison: base operations for weather info, local operating restrictions, radio restrictions, medivac assistance.	2. OIC/UCT, base OPS.		2. Vehicle		2. Meeting	
		3. Liaison: dispensary/hospital, base security, senior enlisted advisor, other diving units.	3. OIC, LPO, HM, base security, base senior enlisted advisor, OIC other diving units.		3. Vehicle		3. Meeting	

INSPECTION OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations	D+4	1. Review available site information. 2. Brief UCT personnel. 3. Unpack	1. OIC, LPO 2. All UCT 3. All UCT		2. Blackboard 3. Inspection equipment.		1. Review available site information.	
	D+5	1. Check equipment. 2. Establish dive locker.	1. 7 UCT divers. 2. 3 UCT divers.	2. (P) Dive locker facilities may not be available at all sites (D) Lack of an adequate facility at some sites.	1. Inspection equipment. 2. Lumber, hand tools.			
	D+6	1. Setup transits or Mini-Ranger. 2. Establish baseline 3. Prepare dive boat	1. 4 UCT (2 qualified transit operators). 2. 2 qualified transit operators. 3. 3 UCT	2.(P) Baseline benchmarks have not been established at all sites. (D) Site surveys not complete for all sites.	1. o Transits (2) or Mini-Ranger (1) o Vehicle o Radios (3) 2. Same as #1 3. o Zodiac (1) o 25 hp outboard (1) o Anchors (2) o Line 1500' (21 thread) o Float balloons (15)			

INSPECTION OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (cont'd)	D+6	4. Rig marking floats	4. 1 UCT diver		4. o Float balloons (15) o Line: 15, 100' lengths of 21 thread			
	D+7	1. Fill tanks. 2. Swim cables to locate/mark cable break.	1. 2 UCT divers. 2. 5 UCT divers, dive boat operator.		1. o Dive tanks(20) o Compressors(2) 2. o Dive tanks (5 sets of doubles) o Dive boat (1 outfitted Zodiac) o Radios (3)		2. Cable Inspection Procedures	2. (P) Existing cable inspection procedures not comprehensive for casualty situation. (D) Specific cable inspection procedures tailored to each site for a casualty situation are not available.
	D+8	1. Fill tanks. 2. Swim cables to locate/mark cable break.	1. 2 UCT divers. 2. 5 UCT divers, dive boat operator.		1. o Dive tanks(20) o Compressors(2) 2. o Dive tanks (5 sets of doubles) o Dive boat (1 outfitted Zodiac) o Radios (3)			

INSPECTION OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (cont'd)	D+9	1. Fill tanks. 2. Take shots on floats to mark cable routes and position of cable break.	1. 2 UCT divers. 2. 2 qualified transit operators, dive boat operator, 5 divers.		1. o Dive tanks (4 sets of doubles) o Compressors (2) 2. o Transits (2) or Mini-Ranger (1) o Vehicle (1) o Dive boat (1) o Float balloons (15) o Anchors (2) o Line: 15,100' lengths of 21 thread o Dive tanks (5 sets of doubles) o Radios (3)			
	D+10	1. Plot results.	1. OIC, 2 qualified transit operators.		1. o Drafting supplies o Base chart	1.(P) Not able to plot quickly the cable routes (D) Plotting charts for all sites not organized in a single document.		

APPENDIX C

INTERIM OPERATION ANALYSIS

POST-INSPECTION AND PRE-REPAIR ANALYSIS								
PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Interim	D+11	1. UCT OIC and CHESDIV rep return to Wash., DC	1. UCT OIC; CHESDIV rep		1. Aircraft			
	D+12	1. UCT OIC briefs results of cable inspection 2. Recommended approach to repairing the cable 3. Concurrence on recommended approach 4. UCT, OIC returns to Norfolk/Port Hueneme	1. NAVELEX, CHESDIV, WECO 2. CHESDIV rep 3. NAVELEX, CHESDIV, WECO 4. UCT		4. Aircraft		1. Meeting 2. Same as #1 3. Same As #1 & #2	
	D+13 to D+17	1. Prepare a repair Project Execution Plan	1. CHESDIV	1.(P) Excessive amount of time (5 days) required to prepare a repair project execution plan. (D) No standarized repair project execution plans available.			1. Technical analysis performed during cable inspection and approved approach developed during briefing of the results of the cable inspection.	1.(P) Availability of CHESDIV personnel to prepare a repair project execution plan. (D) No specific dedication of CHESDIV personnel in the event of a casualty report.
	D+18	1. Briefing of Project Execution Plan 2. Decision is made to effect the cable repair	1. CHESDIV, UCT, NAVELEX, CBLANT/CBPAC 2. NAVELEX		2. Message to CBLANT/CBPAC requesting repair be effected		1. Meeting	

APPENDIX D

REPAIR OPERATION ANALYSIS

REPAIR OPERATIONS ANALYSIS

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Mobilization (for repair)	D+19	1. Arrange transportation to site.	1. UCT, MTO, MSC, MAC, AIRLANT/PAC, commercial carriers	1.(P) Difficulty in rapidly mobilizing a repair team and repair equipment for a specific site. (D) No methods for rapid mobilization of personnel and equipment to any site. (P) Difficulty in evaluating transportation alternatives. (D) No central source of specific transportation arrangements for each site.			1. Message from UCT to military or commercial carriers	
		2. Cut orders.	2. UCT.				2. UCT travel request to site.	
		3. Pack repair equipment	3. UCT.	3.(P) Difficulty in identifying specific equipment requirements for each site. (D) No site by site analysis of equipment requirements. No organized information on specific equipment for each site.	3. Repair equipment	3.(P) Present containers not suitable for equipment transport to all sites. (D) Lack of a set of containers which are suitable for transporting equipment to all sites.	3. All hands effort	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Mobilization (Cont'd)	D+19			(P) Difficulty in identifying critical spare equipment, repair parts, and consumables required for a repair at a specific site. (D) No site by site analysis of requirements for critical spare equipment, repair parts, and consumables. (P) Insufficient required critical spare equipment, repair parts and consumables on hand when a cable casualty is reported. (D) Lack of provisioning prior to a casualty report.		(P) Difficulty in deciding what repair equipment is packed in a specific container. (D) No method for packing each container. (P) Critical spare equipment not available at the time of a casualty report. (D) Insufficient backup equipment during actual repair operations.		
		4. Order material required for repair.	4. UCT, NAVSUP, commercial sources.	4.(P) Inventories may not have cable, cable protection and stabilization system in stock at the time of a casualty report. (D) Lack of provisioning prior to a casualty report.			4. Procurement requests.	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Transit	D+20	1. Complete packing of repair requirement 2. Ship repair equipment to site. Material is shipped as it is procured. 3. Repair team and CHESDIV rep embark for site.	1. UCT 2. UCT, NAVSUP 3. UCT made up 1 OIC, 10 enlisted divers in addition to the 1 LPO diver and 7 enlisted divers already on site, CHESDIV rep.		2. o Lowboys (2) o Forklifts (2) o 25 tons crane (1) o Repair Equipment o Available Material 3. Aircraft		1. All hands effort.	
	D+21	1. Repair team/ CHESDIV rep arrive at site. 2. Customs inspection (if necessary)	1. UCT* repair team, CHESDIV rep *A total of 19 UCT personnel are now on site: 1 OIC, 1 LPO, 17 enlisted UCT (E-6 and below) 2. UCT repair team, CHESDIV rep	2.(P) Lack of knowledge about customs requirements in foreign countries. (D) No organized information on customs requirements for sites in foreign countries.	1. Aircraft 2. All repair equipment			

REPAIR OPERATIONS ANALYSIS (Cont'd

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Transit (Cont'd)	D+22	1. Brief Project Execution Plan 2. Move repair equipment to beach site	1. UCT, OIC; CHESDIV rep; CO base; CO Naval Facility; APWO 2. UCT, base PW (transportation), base receiving		2. o Lowboys (2) o Forklifts (2) o 25 ton crane (1) o Stake truck (1)	2. (P) At specific sites weight handling equipment may be either unavailable or unsuitable. (D) No mechanism to provide weight handling equipment on short notice. Alternative weight handling systems no identified.	1. Meeting	
	D+23	1. Unpack, setup and checkout repair equipment	1. UCT: 1 OIC, 1 LPO, 17 enlisted divers		1. Repair equipment			
	D+24 to D+32 (assume mod. material is available)	1. Prepare ocean construction platform for cable handling, splicing, stabilization	1. UCT, base PW		1. o o/c platform (1) o o/c plaform Modification Material o Welder(1) o Air compressor (1) o Generator (1) o Hydraulic power source (1)	1. (P) With the exception of one site (Keflavik) there are no readily available and suitable platforms at other sites. (D) Suitable platforms are not available. (P) A significant delay in repair operations	1. o o/c platform Modification Plan (1)	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Transit (Cont'd)						is caused by not having a capability to rapidly modify a platform. (D) No capability to convert an available platform suitable for ocean construction operations.		
		TOW REPLACEMENT CABLE SECTION (500 ft)* FROM BEACH						
		*Shipped to the site	NAVELEX	(P) At the time of a casualty report replacement cable section may not be available. (D) Cable not stocked in inventory specifically in the event of a casualty.				
		Events and tasks are continued from D+32						

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair)	D+33 and D+34	1. Moor o/c platform over offshore cable break	1. UCT	1. (P) Mooring designs have to be developed and material procured on very short notice. (D) No central body of knowledge specifically addressing mooring problems at each site.	1. o Concrete clumps (6) or rock bolts			
		2. At a shop facility on site, weld together bellmouth ends of split pipe and spigot ends of split pipe	2. UCT: Welder (1)	2. (P) Short lengths and special configurations of split pipe are required to protect the cable at the splice point. (D) No short lengths and special configurations of split pipe in inventory.				
	D+35 and D+36	1. Destabilize 150 ft of cable on either side of the offshore cable break; float seaward end of cable break to the surface, bring aboard o/c platform and perform seaward cable continuity test; float shore end of cable break to the surface and bring aboard o/c platform.	1. UCT rotating dive teams		1. o Radios (2) o Zodiac (1) o Mechanical nut splitter (1) and/or Hydraulic grinder (1) o Float balloons (15)			

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair) (Cont'd)	D+37	1. Tow replacement cable section to location of break and bring shore end of replacement cable section aboard o/c platform	1. UCT	1. (P) Handling cable in the surf zone. (D) No organized body of information on cable handling techniques	1. o Float balloons (50) o LARC (1) o Zodiac (2)		1. LARC tows replacement cable section to location of offshore cable break.	
	D+38 to D+40	1. Splice shore end of replacement cable section. 2. Float seaward end of cable break to surface and bring aboard o/c platform 3. Splice seaward end of cable break to surface and bring aboard o/c platform	1. UCT, WECO rep 2. UCT 3. UCT, WECO rep		1. o Tent (1) o Cable splicing equipment 2 o Float balloons (15) 3. o Tent (1) o Cable splicing equipment			
	D+41	1. Install odd-end split pipe configurations and apply approximately 500 ft of split pipe along replacement cable section aboard o/c platform	1. UCT	1. (P) Split pipe is heavy and hard to handle. (D) New cable protection techniques are not being developed	1. o Bellmouth to bellmout sections of split pipe (2) o Spigot to spigot sections of split pipe (3) o Split pipe (165-170 whole sections) o Stainless steel bolts and nuts (with nylon inserts) (1320-1360 ea) o Impact wrench (3)			

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair) (Cont'd)	D+42 to D+46	1. Overboard cable; apply split pipe underwater as required; immobilize 500 ft replacement cable section to sea floor.	1. UCT	1. (P) Current cable immobilization system may not be adequate at all sites (D) New cable immobilization techniques are being developed but must be evaluated.	1. o LARC (1) o Split pipe (as required) o Rock drill (1) o Rock bolts (55-60) o U-rods (10) o Grout		1. Standard rock bolts spacing (every sixth pipe section) with U-rods every 50 ft	
	D+47	1. Final cable inspection. LANDING REPLACEMENT CABLE SECTION (600 ft) The following tasks have to be completed before the cable ship arrives. These tasks can be accomplished between D+12 and D+32	1. UCT, OIC; LPO (P) At the time of a casualty report replacement cable section may not be available (D) Cable not stocked in inventory specifically in the event of a casualty.		1. o LARC (1)		1. Swim cable inspecting protection and stabilization system	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair) (Cont'd)		1. Installation: o Range poles on beach o Range lights on range poles	1. UCT, Base PW	1. (P) Difficulty in lining up cable ship with beach site for a cable landing. (D) Lack of a portable system which can be rapidly installed on the beach.	1. o Range poles (2) o Range lights (2)			
		2. Beach leveling as required	2. UCT: bulldozer operator (1)		2. o Bulldozer (1)	2. (P) Special equipment (Bulldozer) may not be available at a particular site. (D) No Mechanism to provide rapidly special equipment.		
		3. Install cable fairlead device between range poles and shoreline as required.	3. UCT: Rock drill operator(1); Welder (1)		3. o Steel pipe (20 ft) o Metal saw (1) o Rock drill (1) o Grout o Welder (1)			
		4. Install mooring for replacement cable section.	4. UCT		4. o Rock drill (1) o Rock bolts (4)			
	D+33	Cable ship arrives; 1. Brief cable ship personnel and establish cable ship to shore communications.	1. Cable ship personnel; WECO rep aboard cable ships; UCT, OIC; CHESDIV rep		1. o LARC (1) o Radios (2)		1. Meeting	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair)		2. Moor cable ship	2. Cable ship personnel				2. Cable ship surveys for an anchor site, anchors, and visually lines up with range lights	
	D+34	1. Lay grapnel rope from beach to the cable ship mooring site; land replacement cable section (6000 ft)	1. Cable ship personnel, all UCT	1. (P) Handling cable in the surf zone during a cable landing is a difficult operation. (D) No organized body of information on cable handling techniques.	1. o Bulldozer (2) o LARC (1) o Zodiac (2) o Chain or rat-tail stopper (1) o BTL stoppers (2) o Grapnel line, 2 reels (5600 ft total) o Float balloons (600)		1. LARC tows grapnel to the cable ship mooring site. Bulldozer hauls grapnel which is attached to replacement cable section. Float balloons attached every 10 ft along replacement cable section.	
		2. Moor replacement cable section.	2. UCT		2. o Zodiac (1)		2. Attach mooring lines from rock bolts to BTL stoppers on replacement cable section.	
		3. Sink replacement cable section.	3. UCT				3. Deflate every other balloon.	

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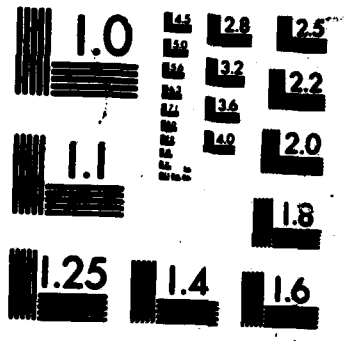

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations (Repair) (Cont'd)	D+35	1. Raise cable seaward of offshore cable break. 2. Splice seaward and of cable break and replacement cable section; overboard spliced section; cable ship departs area.	1. Cable ship 2. WECO rep aboard cable ship				1. Grapneling 2. o Cable splicing equipment	
	D+36 and D+37	1. Moor o/c platform over inshore cable fault	1. DCT	1. (P) Mooring designs have to be developed and material procured on very short notice. (D) No central body of knowledge specifically addressing mooring problems at each site.	1. o Concrete clumps (6) or rock bolts	1. (P) With the exception of one site (Keflavik), there are no readily available and suitable platforms at other sites. (D) Suitable platforms are not available. (P) A significant delay in repair operations is caused by not having a capability to rapidly modify a platform.		

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations Repair (Cont'd)						(D) No capabilities to convert an available platform into a platform suitable for ocean construction operations.		
	D+38 and D+39	1. Cut cable inshore of cable fault 2. Destabilize 100 ft of cable inshore of cable fault 3. Float destabilized end to the surface and bring aboard o/c platform 4. At a shop facility on site, weld together two bellmouth ends of split pipe and two spigot ends of split pipe	1. UCT dive team 2. UCT rotating dive teams 3. Same as 2 4. UCT: Welder (1)	4. (P) Short lengths and special configurations of split pipe are required to protect the cable at the splice point. (D) No short lengths and special configurations of split pipe in inventory	1. o Hydraulic band saw (1) 2. o Radios (2) o Zodiac (1) o Mechanical nut splitter (1) and/or Hydraulic grinder (1) 3. o Float balloons (10) 4. o Welder (1) o Split pipe (4 sections) Result in two odd-end split pipe configurations.			
	D+40	1. Raise moored replacement cable section and bring	1. UCT dive team		1. o Zodiac (2)		1. Reinflate float balloons	

REPAIR OPERATIONS ANALYSIS (Cont'd)

PHASE	DAY	EVENT/TASK	PERSONNEL CMDS, OTHER	ANALYSIS	EQUIPMENT	ANALYSIS	PROCEDURE	ANALYSIS
Operations Repair (Cont'd)		aboard o/c platform. 2. Splice shore end of cable to cable replacement section aboard o/c platform	2. WECO rep, UCT		2. o Tent (1) o Cable splicing equipment			
	D+41 to D44	1. Install odd-end split pipe configurations	1. UCT		1. o Bellmouth to bellmouth section of split pipe (1) o Spigot to spigot section of split pipe (1)			
		2. Apply 2000 ft of split pipe along replacement cable section aboard o/c platform.	2. UCT	2. (P) Split pipe is heavy and hard to handle. (D) New cable protection techniques are not being developed.	2. o Approx. 670 whole sections of split pipe o Approx, 5360 stainless steel bolts and nuts (with nylon inserts) o Impact wrench (3)			
	D+45 to D+49	1. Overboard cable; apply split pipe underwater as required; immobilize 500 ft of replacement cable section to sea floor.	1. UCT	1. (P) Current cable immobilization system may not be adequate at all sites. (D) New cable immobilization techniques are being developed but must be evaluated.	1. o LARC (1) o Split pipe (as required) o Rock drill (1) o Rock bolts (55-60) o U-rods (10) o Grout		1. Standard rock bolts spacing (every sixth section) with U-rods every 50 ft.	
	D+50	1. Final cable inspection.	1. UCT, OIC; LPO		1. o LARC (1)		1. Swim cable inspecting protection and stabilization system.	

APPENDIX E

PLANNING OBJECTIVES, CONCEPT ANALYSIS AND RECOMMENDATIONS

LOGISTICS ELEMENT: EQUIPMENT PHASE: READINESS

DEFINITION: Equipment that must be available in the event of a cable casualty report.

Objective 1: Identify repair equipment requirements for each site.

Concept A(R):* Develop repair equipment lists for each site.

Objective 2: Have repair equipment available for undersea cable system repairs.

Concept A: Position all required equipment at each site. This concept meets the objective but is not cost effective in terms of initial investment and recurring maintenance costs. Concept B: Dedicate a duplicate set of equipment at UCT ONE and UCT TWO. This concept meets the objective but is not cost effective in terms of initial investment.

Concept C(R): Dedicate a part of the equipment at UCT ONE and UCT TWO. This concept partially meets the objective and is cost effective if spare equipment already available is dedicated.

Objective 3: Have an ocean construction platform available.

Concept A: Position an ocean construction platform at each site. This concept meets the objective but is not cost effective in terms of recurring maintenance costs. Concept B(R): Position transportable ocean construction platforms at UCT ONE and UCT TWO. This concept poses some problems since the size of the transportable unit minimally satisfies operational requirements and will involve recurring

*The concept (s) designed (R) is recommended as the most cost effective approach to meet the objective.

maintenance costs. Yet this approach may be necessary for use at sites where other marine vehicles are unavailable for modification. Concept C(R): Develop an ocean construction platform availability plan. The plan will identify the specific site requirements for an ocean construction platform, availability of the required platform at the site and procedures for requesting the use of the platform. In cases where the platform is not available on site, the plan will develop a method for making the platform available.

Objective 4: Have an ocean construction platform modified when required in the repair evolution. Concept A(R): The ocean construction availability plan when complete will identify a platform for each site and a procedure for having that platform available for cable repair operations. Potentially, there will be a degree of commonality in platform requirements and availability. For the resulting common platforms develop platform modification plans which will specify how the platform can be configured for a cable repair operation and the material requirments for modifying the platform.

Objective 5: Minimize the time to modify an ocean construction platform. Concept A(R): Develop an ocean construction platform fly-away modification kit. The modification kit will contain fabricated material (example: deck sections) which can be installed on any of the identified and available platforms.

Objective 6: Adequately moor an ocean construction platform during splicing and split pipe operations. Concept A(R): Develop mooring designs as part of the ocean construction platform availability plan including material requirements for the identified and available ocean construction platform.

LOGISTICS ELEMENT: EQUIPMENT PHASE: MOBILIZATION

DEFINITION: Equipment that has to be staged and packaged for a cable repair at any site.

Objective 1: Have inspection equipment ready for transit to any site. Concept A: Have inspection equipment packed in the event of a cable casualty report. This concept meets the objective but is not feasible because of total UCT requirements. Concept B(R): Prepare an inspection equipment mobilization plan that locates identified inspection equipment and evolves methods for staging and packing equipment for timely shipment to any site.

Objective 2: Have repair equipment ready for transit to any site. Concept A: Have repair equipment pre-packed and dedicated in the event of a cable casualty report. This concept meets the objective but is not cost effective. Further, the operations analysis presented in this plan shows that the repair equipment is not mobilized until D+19 and only after NAVELEXSYSCOM makes a decision to effect the cable repair. Concept B(R): Prepare a repair equipment mobilization plan that locates and evolves methods for staging and packing repair equipment for timely shipment to any site.

LOGISTICS ELEMENT: EQUIPMENT PHASE: TRANSIT

DEFINITION: The transportation of equipment and personnel to any site. Objective 1: Have transportation available in the event of a cable casualty report. Concept A: Purchase an aircraft which is kept on-line in the event of a casualty report. This concept meets the objective but is not cost effective in terms of initial investment; manning and maintenance requirements. Concept B: Dedicate vehicles for transportation to sites in CONUS. This concept meets the objective but is not cost effective in terms of total UCT work requirements. Concept C(R): Prepare a transporation plan for inspection and repair equipment and personnel for each site. For each site the plan should recommend the fastest and most effective route to a site. Potentially, the evolution of this plan will result in a standing instruction for inclusion in an OPLAN or OPORD.

LOGISTICS ELEMENT: EQUIPMENT PHASE: OPERATIONS

DEFINITION: The availability of equipment during actual operations. Objective 1: Have spare equipment available on-site. Concept A: Transport a complete duplicate set of equipment to a site after a cable casualty report. This concept potentially meets the objective but presents problems in packaging, transportation and stowage of equipment at the site. Concept B(R): Identify and transport spare equipment which is not available on site but which is critical during operations.

LOGISTICS ELEMENT: PACKAGING PHASE: READINESS

DEFINITION: The availability of adequate containers to ship equipment to any site.

Objective 1: Have adequate containers available for shipping equipment to any site in the event of a cable casualty report. Concept A: Utilize presently available containers for shipping equipment to any site. This concept does not meet the objective because presently available containers are not adequate for shipping equipment to all sites. Concept B: Identify, fabricate and dedicate containers for each sites. This concept meets the objective but is not cost effective since packaging requirements may be similar for a number of sites. Concept C(R): In conjunction with the transportation plan, develop a packaging plan for each site which identifies packaging requirements for the shipment of identified equipment. As a result of the packaging plan, acquire a set of containers which meet the requirement for shipping equipment to all sites.

LOGISTICS ELEMENT: PACKAGING PHASE: MOBILZATION

DEFINITION: The packaging of equipment after a cable casualty report.

Objective 1: Minimize time required to pack equipment. Concept A(R): Develop container load out lists as part of mobilizaton plan identifying the equipment to be packed in each container.

LOGISTICS ELEMENT: SUPPLY SUPPORT PHASE: READINESS

DEFINITION: Material is defined as the repair cable, and cable protection and stabilization system. Repair parts are defined as replacement parts for inspection and repair equipment. Consumables are defined as expendable items such as oil, gas, oil filters, nails, etc.

Objective 1: Have cable, cable protection and stabilization system available in the event of a cable casualty report. Concept A: Dedicate cable, cable protection and stabilization system at each site or at UCT ONE and UCT TWO. This concept meets the objective but is not cost effective in terms of investment costs. Concept B(R): Maintain a single adequate inventory of cable, cable protection and stabilization system in the event of a casualty report at any site.

Objective 2: Have repair parts identified and available in the event of a casualty report. Concept A: Identify and dedicate required spare parts at each site. This concept meets the objective but is not cost effective in terms of duplicating repair part investment. Concept B(R): Develop Combined Seabee Allowance Lists (COSALS) for the identified equipment which specify repair part requirements and stock repair parts in the Navy supply system.

LOGISTICS ELEMENT: SUPPLY SUPPORT PHASE: TRANSIT

DEFINITION: The transportation of material, repair parts and consumables to each site.

Objective 1: Have repair parts and consumables on site when required. **Concept A(R): Include the transport of repair parts and consumables as part of the transportation plan.**

LOGISTICS ELEMENT: SUPPLY SUPPORT PHASE: OPERATIONS

DEFINITION: The supply and resupply of repair parts and consumables during the repair operation.

Objective 1: Minimize on-site supply and resupply from homeport during operations. Concept A(R): Repair project execution plans should identify critical repair parts and consumables that must be available at all times in homeport inventory. Critical is defined as a repair part or consumable which if not available will cause a significant delay in operations.

LOGISTICS ELEMENT: FACILITIES PHASE: READINESS

DEFINITION: The facilities which must be available to accommodate inspection and repair personnel at a site in the event of a cable casualty report.

Objective 1: Have messing, berthing, maintenance, administration, diver life support, dive locker, and shop facilities identified and available in the event of a cable casualty report. Concept A: At each site, construct a facility for the use of inspection and repair personnel. This concept meets the objective but is not cost effective in terms of initial investment. Concept B(R): Analyze site information to determine the adequacy of on-site facilities. At sites where adequate facilities are not available develop portable facilities.

LOGISTICS ELEMENT: FACILITIES PHASE: TRANSPORTATION

DEFINITION: The transportation of portable facilities to a site.

Objective 1: Have portable facilities on site when required. Concept A(R): Include in transportation plan the movement of portable facilities to sites where they are required.

LOGISTICS ELEMENT: FACILITIES PHASE: OPERATIONS

DEFINITION: The facilities on-site which can be made available to inspection and repair personnel during operations.

Objective 1: Have arrangements made to utilize on-site facilities wherever possible. Concept A(R): Develop standing document, OPLAN or OPORD, which specifies facility requirements for each site.

LOGISTICS ELEMENT: DATA & INFORMATION PHASE: READINESS

DEFINITION: The data and information base that should be available about each site in order to conduct inspection and repair operations in the event of a cable casualty report.

Objective 1: Have available complete and concise data and information on all sites including cable routes, environmental data, on-site facilities, on-site equipment and materials that are available.

Concept A: Utilize available site survey reports as is. This concept is cost effective but does not meet the objective. The available information is not organized in one concise document. In addition, site surveys have not been completed on some sites. Concept B(R): Analyze available site survey reports and organize data and information into standardized project execution plans which are appropriate for inclusion in a standing document such as an OPLAN or OPORD. In addition, obtain data and information on sites which have not been surveyed.

LOGISTICS ELEMENT: DATA & INFORMATION PHASE: MOBILIZATION

DEFINITION: The data and information base necessary to mobilize personnel and equipment rapidly after a cable casualty report.

Objective 1: Have available complete and concise data and information necessary to mobilize UCT personnel, equipment, portable facilities, material, repair parts and consumables. Concept A(R): Include in project execution plan for each site the mobilization data evolved as a result of the mobilization plan.

LOGISTICS ELEMENT: DATA & INFORMATION PHASE: TRANSIT

DEFINITION: The transporation data and information base necessary for rapid transportation to each site.

Objective 1: Have transportation data and information available for each site. Concept A(R): Include in project execution plan for each site the transportation data and information evolved as a result of the transportation plan.

LOGISTICS ELEMENT: DATA & INFORMATION PHASE: OPERATIONS

DEFINITION: The data and information gathered as a result of inspection and repair operations at a site.

Objective 1: At completion of any operation have data and information required to prepare the report on the operation. Concept A(R): Collect all operational data needed to prepare final report. Concept B(R): Prepare cable inspection and repair and survey reports as required.

END
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